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ABSTRACT

This study attempted to identify specific social environmental factors of the home that are related to science achievement at the primary school level and to determine the extent of the relationships between achievement in science and the factors identified. A sample of 200 subjects were given three instruments in a group setting, a mental ability test, an achievement test, and a student questionnaire. Findings indicate that: (1) boys achieved better in science than girls and that younger students achieved better than older students at the same class level; (2) brighter children attended school more regularly than dull students and bright boys attended school more regularly than bright girls; and (3) social environment of the home was not significantly related to achievement in science. However, sub-variables of parental unity, parental status, and family conditions were found to be significantly related to achievement in science for boys. The study also confirmed the positive correlations between achievement in science and intelligence quotients (sample = +0.50; girls = +0.55; boys = +0.46) as obtained by others in previous studies. (The student questionnaire and science achievement test used are included in appendices.) (Author/JN)

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SE 045 110

African Studies
in Curriculum Development & Evaluation

General Editors: Peter Sachsenmeier
Kofi B. Quansah

No. 123.

S.L. ABETI:

THE RELATIONSHIP BETWEEN SOCIAL ENVIRONMENT IN THE HOME & ACHIEVEMENT IN SCIENCE - UGANDA.

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This research project was undertaken as part of a training programme jointly organised on behalf of the African Curriculum Organisation (ACO) by the Kenya Institute of Education (KIE), the University of Nairobi, and the German Agency for Technical Cooperation (GTZ).

THE RELATIONSHIP BETWEEN SOCIAL ENVIRONMENT OF THE HOME, AND ACHIEVEMENT IN SCIENCE.

BY

STEPHENSON L. ABETI
B.ED.(MUK); M.ED; DIP.SC. ED-
(NJALA - USL)

THESIS

SUBMITTED TO THE FACULTY OF EDUCATION, UNIVERSITY OF NAIROBI, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE POST GRADUATE ADVANCED DIPLOMA IN SYSTEMATIC CURRICULUM DEVELOPMENT.

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AUGUST, 1983.

DEDICATION

DEDICATED TO MY DAUGHTER

CAROLINE ABETI

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However, the author is wholly responsible for all the errors that may occur in the text of the paper.

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A B S T R A C T

Although not much has been done in African situations, socio-economic, cultural, School Environment, home environment and Intellectual growth factors, have been identified as general factors that may influence children's achievement in School. This study examined social environmental factors of the home that may influence children's achievement in Science.

The study attempted to identify specific social environmental factors of the home that are related to achievement in Science at Primary School level; and to determine the extend of the relationships between achievement in Science and the factors identified.

A Sample of 200 subjects were group administered three instruments: " Mental Ability Tests", "Questionnaires for Pupils", and " Science Achievement Test". Graphs and Histograms were drawn and Means were calculated from the results obtained. Correlation Coefficients between the

dependent variable of Science achievement test, and the social environments of the home were calculated, using the controls of School attendance, age records and Intelligence Quotients.

The findings indicated that:

(i) Boys achieved better in Science than Girls and the younger pupils achieved better than older pupils at the same class level,

(ii) Brighter children attended school more regularly than dull ones. More bright boys attended School more regularly than bright girls,

(iii) Social Environment of the home was found to be not significantly related to achievement in Science. However, Sub-variables of Social Environment of the home: Parental Unity, Parental Status and Family Conditions were found to be significantly related to achievement in Science for boys.

(iv) The study also confirmed the positive Correlations between achievement in Science and Intelligence Quotients (Sample = + 0.50, Girls = + 0.55, Boys = + 0.46) as obtained by others in the previous studies.

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CHAPTER I

STATEMENT OF THE PROBLEM

1.10: INTRODUCTION

Many systems of education have continued to use Achievement Test results for promotion to higher levels in educational institutions and for selection for training and employment. However, little attention has been paid to what constitutes Achievement Tests and the factors that might influence Achievement.

Several studies have been carried out on the child's learning environments, especially in relation to intellectual growth (Piaget, 1947, Brunet, 1964, Vernon, 1964 and 1969). Similarly, work on what constitutes Achievement Tests, Standardised Aptitude and Intelligence Tests, and general evaluation systems have been done (Arthur, 1962; Evans, 1970; Bloom, 1971).

However, only general factors have been identified as factors that might influence Achievement itself, such as:

(a) The School Environmental Factors:

(i) Teacher - Pupil Ratio.

(ii) Number of Classrooms and specialist Rooms available.

(iii) Teacher Qualifications and supply.

(iv) Supply of Scholastic materials and Teaching Equipments.

(v) Teaching Methodology.

(vi) General School Administration and Supervision of Teachers and Administrators.

(vii) Range of Curricular Activities.

(b) Socio-Economic and Cultural Factors.

(i) Social Class levels in society

(ii) Cultural differences in society

(iii) Economic viabilities within the society.

(iv) Attitudinal aspects of schooling within the society i.e. values of education realised by the immediate community.

(v) Interests and vocational aspirations within the community.

(vi) Indigenous Technical skills and scientific experiences within the society.

(c) Intellectual Growth Factors.

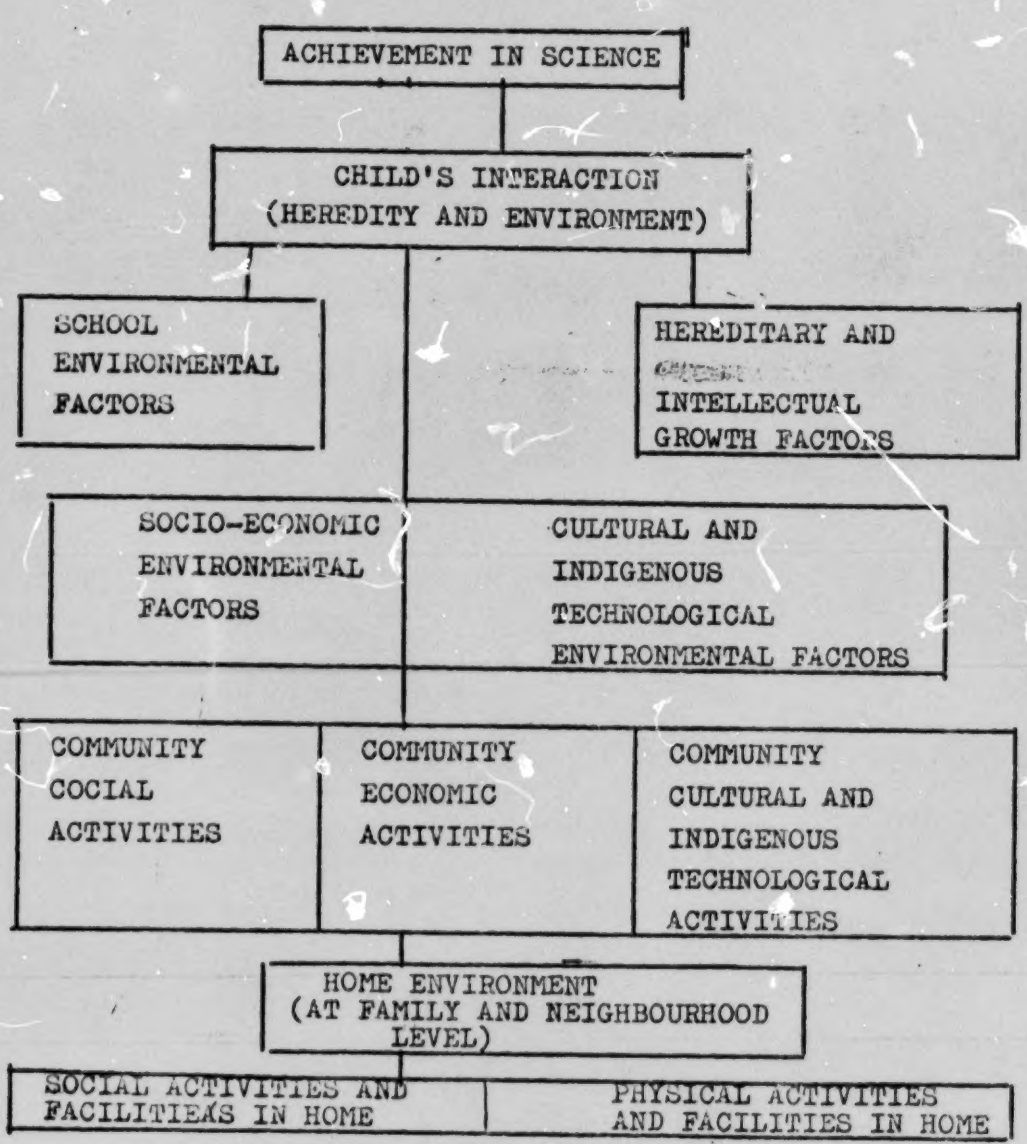
Studies related to hereditary factors, intellectual growth, intelligence, and intelligence quotients, have been carried out by many experts. Intelligence has been labelled as the best predictor of school Achievement by these experts. Thus, if environmental factors were scientifically proved to have significance, then all might have additive effect in predicting Achievement. To these experts of Intelligence, the Environmental and Hereditary factors have a mutual effect on development of intelligence. Hence many claim that the term "Environment" includes Biochemical and physical conditions before and after birth. The investigator agrees with this view. Thus an inadequate diet during pregnancy, first six years of life, maternal stress etc. affect formation of brain tissues, and therefore intelligence of the child. (Varma and Williams, 1976).

(d) Home Environmental Factors.

Within each family structure, there are social and physical Home Environmental Factors, generally identified which influence Achievement in school. The social Environment of the Home is the central area of the present study, and has been outlined in details in Section 1.20. below.

Figure I below illustrates diagrammatically the representation of the complexity of Hereditary and Environmental influence on Achievement in science. This module could be applied to any subject learnt in schools.

FIG.1: DIAGRAMATIC REPRESENTATION OF COMPLEXITY OF HEREDITARY AND ENVIRONMENTAL INFLUENCES ON ACHIEVEMENT IN SCIENCE


ACHIEVEMENT IN SCIENCE
CHILD'S INTERACTION (HEREDITY AND ENVIRONMENT)
SCHOOL ENVIRONMENTAL FACTORS
HEREDITARY AND INTELLECTUAL GROWTH FACTORS
SOCIO-ECONOMIC ENVIRONMENTAL FACTORS
CULTURAL AND INDIGENOUS TECHNOLOGICAL ENVIRONMENTAL FACTORS
COMMUNITY COCIAL ACTIVITIES
COMMUNITY ECONOMIC ACTIVITIES
COMMUNITY CULTURAL AND INDIGENOUS TECHNOLOGICAL ACTIVITIES
HOME ENVIRONMENT (AT FAMILY AND NEIGHBOURHOOD LEVEL)
SOCIAL ACTIVITIES AND FACILITIEAS IN HOME
PHYSICAL ACTIVITIES AND FACILITIES IN HOME

By. S.L. ABETI.

1.20: THE PROBLEM

It is because of the above situations that the present study is undertaken to identify some of the specific factors that are related to achievement in science at primary six school level. The study is also expected to determine the extend of the relationships between achievement in science and each of the factors identified. Hence the emphasis on the study is to identify some of the specific variables and sub-variables within the Social Environment of the Home, and determine the extent of their relationships with the school Achievement in science.
The social Environment of the Home refered to here is the child's interaction with the people, activities and conditions in the Home.
The Home here is taken at the Family and Neighbourhood level.

Due to the wide scope of the related field of study, the investigator has decided to concentrate on establishing the relationship between the Dependent variable of Achievement in science at Primary six school level, and the following Independent variables:

(a) Social Environment of the Home.
(b) Intelligence Quotient.
(c) Record of School Attendance.
(d) Record of Chronological Age.

Therefore, the specific questions the study is seeking to answer are:

(a) What are the specific social Environmental factors of the Home, that are related to Achievement in science at Primary Six School level?

(b) How does a child's Intelligence Quotient relate to Achievement in Science as compared to the relationship between social Environment of the Home and Achievement in Science, at Primary six school level?

(c) Are there any relationships between a child's level of School Attendance and Achievement in science, at Primary Six School level?

(d) Are there any relationships between a child's chronological Age and Achievement in science, at Primary six school level?

(e) To what extent are each of these factors identified, related to Achievement in Science, at Primary Six School level?

1.30: THE SIGNIFICANCE

It is hoped that Teacher Educators, Educational Administrators, Classroom Teachers, and Parents alike might find the information obtained by this study useful for guiding learners in and out of school, especially at primary level. This study may also give information to the curriculum designers about what to include in the curriculum of the primary school science. The awareness of

these specific factors may then help the primary school science teachers in the assessment of their pupils. Parents and the education Administrators should also be made aware of some of the optimum conditions under which children must be exposed for better concept formation of the future life. Hence the isolation of some of the most important factors in our society, that need extra attention from the community, that live in a particular socio-economic, physical and cultural environment, is a necessity.

1.40: THE OBJECTIVES

The following list would represent an outline of the objectives of the study:

(a) To identify by use of questionnaires, the social Environmental factors of the Home and correlate the coded results with Achievement in science.

(b) To Administer a Culture Fair Intelligence Test and to Convert the results of each subject into Intelligence Quotients before Calculating Correlation Coefficients between the results and Achievement in Science.

(c) To establish, from records of school Attendance, the levels of School Attendance of each subject, graded A, B, C and D, and relate this to means of Achievement in science.

(d) To establish from age records and from parents and the subjects themselves, the chronological Age of each subject:

(i) To use this Chronological Age (CA) for falculating the Mental Age (MA) before calculating the intelligence Quotient for each subject i.e.

$$I.Q. = \frac{MA}{CA} \times 100$$

(ii) To correlate the Chronological Age with Achievement in Science.

(e) To construct a common science Test and Administer it to all the subjects for determining the Achievement levels in Science, which acts as the Dependent Variable.

1.50: THE LIMITATIONS.

(a) The financial limitations will restrict the area to be covered, the ultimate sample, length of time spent on data collection etc. Hence the Investigator intends to use only few Primary Schools in one District Town of Uganda.

(b) Measurement of Environmental Cultural and Socio-Economic variables in Educational Research and elsewhere, have been expressed by many Educationists and others, as being a difficult undertaking.

(c) Written literature resources on Home Environment, Achievement and Intelligence, relevant to the African situation are very much inadequate.

(d) School Records of Children's Age and School Attendance may not be very reliable in Many African schools, especially Ugandan Schools at present.

(e) The absence of a standardised Achievement Test in Science for African children, which could perhaps have been more suitable.

(f) The absence of a standardised Instrument for measuring Home Environmental Factors especially for African situations.

CHAPTER II

REVIEW OF THE LITERATURE

2.10: INTRODUCTION

Science has been claimed to make or produce solutions to many pressing problems of both developed and developing countries. Industrialisation, Defence, Medicine, Agricultural science in Africa and elsewhere, are being received with fresh motivations for further research in the specific areas of knowledge. Since their Independence, African countries have made impressive efforts in developing their science education. These efforts have led to more pressing challenges as new curriculum aspirations create an ever-widening gap between societal expectations and the National Achievements in science, (UNESCO - Paris, 1978). It is possible therefore in science Education to have the curriculum evolve as an unfolding story in much the way that learning unfolds in a research laboratory. In order to achieve this goal, a special orientation is needed for the future citizens. The orientation should therefore claim at enabling each individual to develop his or her potentialities, creativity, and critical mind both for his or her own fulfilment and happiness, and for serving as a useful citizen and producer for the development of the community to which he or she belongs (UNICEF - Nairobi, 1974).

This particular philosophy of science education in Africa today is being experienced on by many forms of curricula, such as Inquiry Science, Integrated Sciences, Basic Education or Integrated Technology into Basic Education etc. However, little has been un-earthed from the African Home Home Environment about the children for whom we design such curricula. The present study has been designed to remind the African Educationists of their roles towards this primary area of educational information, for Teacher effectiveness.

2.20: THE CHILD'S SCIENTIFIC ENVIRONMENT

The child on entering school, sees a different world from home. He is taught in a second or third language. There are no mechanical toys at home from the illiterate or semi-illiterate parents who are poor and belong to an unscientific lif style. The schools on the other hand are badly equiped, poor buildings, isolated, understaffed, with almost no supervision of teachers by Inspectors and Education Officers. The basic necessities like paper, pencils, chalk, ink etc. are inadequate. The textbooks are out of date, and very few, with almost no library books. The effective use of the limited available materials is severely inhibited where the teacher can only communicate to the child in English or French. The design, supply and distribution of scholastic materials are therefore some of the greatest limiting factors in all African countries (Young, 1973)

Therefore science at Primary level in Africa has still been knowledge of subject matter as outlined in the syllabus, and put across by a teacher. The prescribed books, if any, are followed closely and misused as teachers do not have the resources within themselves, due to lack of proper training. Many of the practicals suggested are not carried out, but memorised. Teaching is therefore reduced to reading the textbook, and does not provoke interest and thought. A child thus leaves the primary school having had no chance to experience real science and science is still absent in his life (Gilbert and Lovegrove, 1968; Blackwood, 1965; and Prestt, 1972 and 1976).

Most African Governments are aware of these serious conditions, and have now some form of advisory panels working on the primary and secondary science curricula, new syllabi, and teaching programmes. Many African countries have also instituted National Curriculum Development Centres, attached to Ministries of Education, to organize curriculum work in the country.

The objectives of science Education in the primary schools were not stated explicitly. A Commonwealth Conference at Lagos in 1960, on "Science in the Advancement of Newly Independent African states" resolved that Science should be

taught in primary schools in Africa. However, it should not merely serve intellectual purposes only, but it should also aim to equip young persons with a functional and rational understanding of their world to a level that would create in them feelings of liberation and mastery of the African Environment. In another Conference for African Primary Science Programme (APSP) at Kano, Nigeria in 1965, a definitive overall objective of primary science was suggested. It was focussed on development of children Intellectually, physically, culturally and socially, so as to understand and make rational decisions about their total Environment; science was thought to be a useful medium for this development of children because of its nature, methodology, and wide applicability. This led to the formation of "Science Education Programme for Africa - SEPA" (SEPA 1974) early 1970. To date APSP and SEPA have produced various types of primary science curriculum materials. These materials mostly emphasize intellectual processes and concepts, inquisitiveness interests, attitudes, and physical and manipulatory skills to be achieved by children in primary schools.

2.30: INTELLIGENCE AND ACHIEVEMENT

Apparent distinctions between "Intelligence" and "Achievement" have been examined and discussed by many Educationists (Vernon, 1954; Gage and Berliner, 1974; Varma and Williams, 1976; etc.).

Intelligence is determined by innate factors and develops along a pre-determined pattern given a "normal" environment. Therefore intelligence refers to generalised thinking powers which have developed from experience in and out of school, while achievements are more directly influenced by the school curriculum. Therefore achievement is something acquired or learned and results from active learning process. High correlations have been recorded between general achievement tests and intelligence (Kelly, 1927; Thurston, 1969; Wolf, 1971; etc.). Most psychologists agree that there is no sharp distinction between measured intelligence and Educational Achievements. Both are products of the interaction between genetic and environmental factors and both consist of knowledge, skills and attitudes that are learned. However, intelligence mostly expresses abilities that result from the informal, unarranged interactions of the individual with the culture in which he lives (Gage et al, 1974).

2.40: INTELLIGENCE AND HOME ENVIRONMENT

Many variables exist in the Home Environment that seem to make a difference in the intellectual achievement of children. Researches indicate that home environment affects intelligence quotient. Good homes and parents turn out children

whose intelligence quotients are higher than would be predicted from true parents Intelligence Quotients. However, what variables in the home make the difference is still not clear. The differences in intelligence quotients among various social groupings of children show that middle class children score higher than low class children and urban children score higher than rural children. Therefore the two best tools for reducing the group differences are the Home and the school (Gage et al, 1974).

Differences between schools and Teachers have little influence as compared to the differences between parents, since children grow for a long time with them. Hence differences between parents will explain more of the variations between children than differences between schools. However, Irvin (Mehrens and Irvin, 1969) found out that individual differences among teachers in Africa produce greater effects than either individual differences among children or differences in family circumstances. The investigator is very pessemistic about this view. This is because there is a great variety of conditions existing in African cultures as compared to Europe. It is also difficult for an outside psychologist to tell all the outstanding or significant parameters in child rearing.

There are differences between children of different generations, different sexes and within each sex and individuals varying with age. Hence a child's intelligence Quotient tested earlier changes when tested later. The relationships between environmental and genetic factors in shaping of human abilities, therefore exists. Hence the social circumstances of the home, academic achievement and intelligence are closely related.

Therefore adverse environmental conditions may slow physical growth but regain later when conditions change to a better one. Change from poor to good environmental conditions may also have similar effects. Relationships between socio-economic groups, family size and tests of mental abilities in children have been recorded. Family's occupation or income attitudes and traditions of child care and its whole cultural outlook, all bring about variations between individuals. As more intelligent and forward looking parents move up the social scale, so their children's conditions improve for better intellectual and emotional development. Research has also shown that there is a positive correlation between a child's size at any age and scores on tests for measured intelligence. The upper socio-economic groups also have larger average body size of children than low class children at all ages. Intellectual processes in a child would therefore not function fully unless

conditions exist for its development (National Child Development Study, England, 1971).

Vernon (1969) found out that the important factors in children's achievements are the cultural and socio-economic levels of the home, defective education, linguistic environment, family instability and parental educational encouragement. However, many educationists have confessed that the assessment of the effects of environment on children in underdeveloped groups have been difficult due to great differences between home environments of different children (Varma et al, 1976).

Wolf (Bloom, 1971) found correlations between home variables and Intelligence Quotient to be 0.76 and Fraser (Varma et al, 1976) found it to be 0.69. Urbach (Varma et al, 1976) states that these correlations prove little about environmental effects, but show that parental education, and encouragement are better indicators of parental genes, or are more potent stimulators than parental income, or social Economic status (SES). He (Urbach), also says that holding SES constant would eliminate both genetic and environmental differences. Hence studies to develop these theories of the effects of environmental conditions on intelligence explain

nothing. The present investigator disagrees with the last part of the above line of argument by Urbach, using the following evidences of environmental influences.

Newman, Freeman and Holzinger (Varma et al, 1976) found out that identical twins reared apart brought about intelligence quotient differences of up to 24 points. The bigger differences in the environmental conditions were associated with bigger differences in Intelligence Quotient. Johnsen and Gottfried (Varma et al, 1976) defined the term "Environment", to include biochemical and physical conditions before and after birth. Thus inadequate diet during pregnancy, first six years of life, maternal stress birth difficulties etc. affect formation of brain tissues and therefore intelligence of the child. Vernon (1969) also found out that poor environment means poor achievement in school and lower score in Intelligence Tests. Apart from these findings, many people have done studies on various aspects of the environment and have all found their significant effects on the Intelligence Quotients of the Children (Varma et al, 1976)

e.g. (a) Emigration to Cities by Klineberg and Lee.

(b) Foster Homes and retarded children and retarded mothers by Freeman, Burks, Leahy, Skeels, Heber and Clarks.

(c) Absence of Human Contact by Koluchova.

(d) Extreme poverty of physical and social Environment by Spitz, Goldfarb, Denis and Narjarian.

(e) Restricted Environment by Hebb and Lavine, etc.

Evidences indicate that as genetic similarity between persons increases, their Intelligence Quotients also increases. Hence correlation between Intelligence Quotients of identical twins reared apart goes slightly down. In a given population growing up under a given environmental circumstances:

(a) X% of the variability in Intelligence can be attributed to inherited factors (genotype).

(b) Y% attributed to environmental factors.

(c) Z% attributed to Phenotype - environmental interaction.

The more uniform the environment, the greater the proportion of variability due to genotype e.g. England as compared to Africa. Genetic factors

operate throughout growth and not all genes are active at birth. Some begin to exert their influence later in life. Circumstances rarely change so much in the environment to lower or raise the Intelligence Quotients greatly. Individual differences in the rate and amount of learning also depend more on genetic factors than on environmental variations (Varma et al, 1976). Burt and Jensen (Vernon, 1969) calculated the hereditability of general Intelligence from parents and found it to be 80%, leaving only 20% due to environmental factors, when the environment is more uniform. They found out that even the intelligence of twins depends on the one who comes out first or later.

They also found out that environment affects Intelligence more at lower levels of ability, above a certain minimum level it has little further effect.

Hebbs identified two types of Intelligence and labelled them as A and B, and Vernon (1954 and 1964) added Intelligence C.

(a) Intelligence A - This is the genotype, basic genetic potential of the individual. It is innate, inherited through genes, and determinant of mental growth. It cannot be observed, nor measured.

(b) Intelligence B - This is the phynotype, the developed Intelligence observed in thinking and behaviour. It is the product of interaction between Intelligence A and stimulating or inhibiting properties of the environment. It can therefore be both observed and measured. What is observed is the product of Nature and Nurture. Therefore our Intelligence Tests take samples of Intelligence B only, which are incapable of measuring Intelligence A directly.

(c) Intelligence C - This is the mental age or Intelligence Quotient or score on one of the Tests. It is the Present level of Intelligence functioning.

Intelligence B, changes with changes in the environment, hence develops differently in different physical, social and cultural environments. It is therefore not fair to evaluate the Intelligence B of other ethnic groups on same criteria. Such groups require and stimulate the growth of different mental, as well as physical and social skills to cope with their particular environments. They therefore possess different Intelligences B. How far Intelligence C can serve as an index of Intelligence A is still not agreed among psychologists.

However, the Intelligence Quotient has its educational values. It can only be properly avaluated if we have clear, not over-simplified idea of what intelligence Tests scores represent, on what they are based, by how much they vary and for what reason, since several factors affect the result of a child's score in the Intelligence Test. "Culture Free" Intelligence Tests have been difficult to construct, but many "Culture Fair", Intelligence Tests are available.

SOME EXAMPLES OF STANDARDISED INTELLIGENCE TESTS

(a) The Stanford- Binet Intelligence Tests by L.M. Terman and M.A. Merrill (1960). Revised several times. First by McNemar, O (1942).

(b) The two Wechsler Intelligence Scales:

(i) For Adults - WAIS (Age 16 and over) by Wechsler, D. (1955)

(ii) For children - WISC (Age 5-15) by Wechsler, D. (1949).

(c) The California Test of Mental Maturity by E.T. Sullivan, W.W. Clark, and E.E. Tiegs (1963).

(d) The Kuhlmann-Anderson Intelligence Tests by F. Kuhlmann and R.G. Anderson, (1952).

(e) The Lorge-Thorndike Intelligence Tests by I.D. Lorge and R.L. Thorndike (1954).

(f) The Multi-Racial Picture Intelligence Tests by Y.K. Lule (for African and Asian Children. Wheaton and Company Ltd. London (1967).

Intelligence Tests are best expressed as percentiles and each test has a different classified "norms" or ranges of interpretations of the Intelligence Quotient results as shown in Table I below:

Table I: The norms of Starford-Binet and Wechsler Intelligence Tests

Classification:	Intelligence Quotients	
	Starford-Binet Tests SD = 16	Wechsler Tests SD = 15
Brilliant & Genius	139 and above	137 and above
Very superior	128 - 138	126 - 136
Superior	117 - 127	116 - 125
Bright	106 - 115	105 - 115
Normal	95 - 105	96 - 104
Dull	84 - 94	85 - 95
Inferior	73 - 83	75 - 84
Borderline	61 - 72	59 - 74
Mentally deficient	Below 60	58 and below

From: Frederick B. Davis, Educational Measurements and their interpretation. Wadsworth Publishing Company, Inc. (1964), Chap. VI.

Similarly, the percentages of the Total Human population in each of the groups of the Intelligence Quotients for each test can be calculated as shown in Table II below for Starford-Binet Test:

Table II: General Flexible Ability Classification:

Classification	Intelligence Quotient	% of all Human Pop.
Near Genius/ Genius or Briliant.	140 and over	1
Very Superior	130 - 139	2.5
Superior	120 - 129	8
Above Average	110 - 119	16
Normal or Ave.	90 - 109	45
Below Average	80 - 89	16
Dull or Borderline	70 - 79	8
Feeble minded or moron	60 - 69	2.5
Imbecile or Idiot	59 and below	1

From: William A. Mehrens and Irvin J. Lehmann, Standardised Tests in Education. Holt Rinehart and Winston Inc. (1969). Chap. III pp. 303.

2.50: ACHIEVEMENT AND HOME ENVIRONMENT

The characteristics of the home background of children such as the culture, social class, number of children in family, child's birth order, mother's age, parental encouragement and aspirations, etc. are related to actual achievement in school. The relationship between motivation and achievement is usually high. However females are usually more motivated to perform in those areas our society has traditionally designated as appropriate for women e.g. social skills and relations. Evidence shows that mechanical, spatial and athletic skills are considered masculine, while social, verbal and artistic skills are considered feminine. Hence for girls, achievement in science has some built-in punishing effects (Gage et al, 1974).

As a course starts, the instruction starts at the same assumed zero point for all members of the class. However these members are exposed to different home background environments and different amounts of independent study and readings (Sands, 1979). As these differences in home backgrounds increase, the variance from an imaginary zero point increases. Diagnosis of such conditions by an

evaluative method will reveal to the teacher, the position at which each student is, at the beginning of the course (Bloom, 1971).

The long range goal of bringing about a more uniform home background, is to break the "poverty cycle" which is a national problem in African countries. The cycle operates, so that parents low in scholastic ability and consequently low in educational level, create environments in their homes and neighbourhoods, which produce children similarly low in scholastic ability and academic achievement. These children become the next generation of parents, repeating the process. Home environment can influence the child's ability in two ways: the child can learn directly from the environment and from copying the adults, or the child can have his personality traits and ways of using his ability influenced by parental attention, aspirations and attitudes. Some of these important environmental factors identified by Wolf (Bloom, 1974) and Gage and Berliner (1974) are the following:

(a) Pressure for Achievement Motivation.

(b) Aspirations for the child's Achievement.

(c) Knowledge of the Child's intellectual development.

(d) Rewards for Intellectual Achievement.

(e) Pressure for language development.

(f) Provisions for general learning opportunities and intellectual needs at home, school and outside school.

(g) Willingness to guide and devote time to the Child.

(h) Acceptance versus rejection of the child's Behaviour.

Vernon (1969) also outlined specific factors in the environment that affect achievement and Intelligence, such as the following:

(a) Poverty.
(b) Poor Nutrition.
(c) Poor Health.
(d) Over-crowded Home.
(e) Lack of Intellectual stimulation.
(f) Inferior Language background.
(g) Lack of parental interest in education.
(h) Poor Schooling.
(i) Insecure economic future.
(j) Genetic differences.

The same study by Vernon (1969) also expressed that classical experimental approaches for environmental studies are difficult and that the longitudinal studies take too long and expensive.

Douglas and Ross (Vernon, 1969) also did extensive studies in this area and found out that the most important factors in achievement apart from social class are lack of Parental interest and aspirations, over-crowding, unsatisfactory home conditions, lack of household amenities, family size, and poor maternal care. Eldest children tend to improve more, because parents have higher aspirations for first borns. Girls adjust better to primary schooling and are more docile than boys. Douglas and Ross deduced from their studies, that good schools build traditions for better achievements. The lower class children on average are also lower in effective Intelligence and Educability, because of genetic differences, poor pre- and post-natal care, and poor parental care and aspirations.

However, French (Wiseman, 1964), carried out a study on 2,000 children in 41 schools and found out that father's occupation and achievement have no relationships. While Black (Wiseman, 1964) found out that Boys correlation was higher than Girls. Griffiths and Pidgeon (Wiseman, 1964) in Britain found out that parental encouragement

and attitudes are the determining factors in grammar schools, Nisbet (Wisemann, 1964) also found out that Intelligence is negatively correlated with size of the family, but educational achievement is more closely associated. The less skilled the occupational group, the larger the family and the shorter the school life.

Stephen Wisemann (Wisemann, 1964) performed an experiment on the relationship between Achievement ans School Attendance. He classified his subjects according to records of attendance into four groups from A to D. He used the creteria: A - Excellent, B - Occasional Absences, C - Frequent Absences, and D - Long Absences. He found out that pupils in C were better than those in D, and there were more boys in A and B than girls. There were also more girls in C than Boys. He also found out that means of achievement decreased along the groups from A to D for each group of subjects results. He therefore Hypothesized that high attendance should show beneficial effects on achievement in school, and that well motivated and brighter children would attend school more regularly.

2.60: SUMMARY

The African countries have made reasonably significant efforts in developing their science education within the last two decades. Many new

curriculum packages, panels, centres, and organizations have evolved due to societal expectations and aspirations.

However, limitations exist in the availability of information about the African Environment for Teacher effectiveness in the African Schools. The differences in the educational backgrounds of children are some of the main ones responsible for the differences in the children's patterns of achievement. The greater the difference in educational backgrounds, the greater the differences in achievement. Therefore the school and the Home Environment reduce or increase differences in Achievement. Good Homes and Parents or Upper Class, turn out children with higher Intelligence levels, growth rates, and better achievements, than poor homes and parents or lower class.

Underlying the school and Home Environment is the nature and growth of the child, which varies between boys and girls, and within each sex and individual, with different age levels. Relationships between Environmental factors and Genetic factors in shaping the human ability also exists. These environmental and Hereditary factors interact to produce differences between socio-economic classes. Hence the school and the Home Environments, Intelligence and Achievement are closely related.

If the term "Environment" of the child is defined as to include Biochemical and Physical Conditions before and after birth, various factors will affect the growth and consequently the child's Intelligence and school Achievement. From the numerous studies carried out, the major Environmental conditions that most influence Achievement and Intelligence seem to be: Socio-Economic and Cultural background, maternal care, school characteristics, parents' own intellectual levels and their aspirations, Parental encouragement and attitudes towards education.

Variations in the characteristics of an individual is caused by genetic composition. The environmental factors, and the interaction between the genetic composition and the environmental factors. The more uniform the environment, the greater the variability due to genetic composition. However, the environmental conditions rarely change so much as to lower or raise the intelligence quotient greatly. Hence individual differences in the rate and amount of learning depend more on genetic factors than environmental factors.

CHAPTER III

DESIGN OF THE STUDY

3.10: INTRODUCTION

The strategy adopted here for describing the design of the study has been classified under the headings of:

(a) Method of sampling.
(b) Development of Measurement Instruments.
(c) Administration of Instruments and Data collection.
(d) Methods of Data Analysis.

3.20: METHOD OF SAMPLING

The investigator used few randomly selected primary schools in Arua District town in Uganda. Transport, Finance and Time factors limited the investigator to use primary schools within three miles' radius from the centre of Arua Town. There were about twenty five primary schools within this area of the town and five primary schools were randomly selected plus one primary school for pilot study. Then only class or standard six pupils were used for the investigations in each selected primary school.

The estimated number of subjects was initially two hundred and sixty. The Instruments were group administered to whole classes in each primary school. The exact number of subjects to be used was arrived at after evaluating each subject in

the three intruments used for measurements, and accurate records of chronological age and school attendance. The following reasons were used for rejecting answer sheets for final analysis:

(a) Not attending all the three measurement instruments during administration.

(b) Incomplete answer sheets of less than 85% of work done.

(c) Lack of concentration and carelessness during the exercises.

(d) Lack of accurate age record.

(e) Lack of record of school attendance.

(f) Clear evidence of inaccurate information.

Class six were selected for the investigation because of the following factors that could affect the results of the investigations:

(a) Classes lower than class six would have more acute problems in understanding English used for the exercises.

(b) Class seven were involved in preparing for their final National Examinations and would not have the interest required.

(c) Pupils in class six would remember their age records told by parents better than those in lower classes.

FIG.2: PLAN OF SAMPLING DESIGN

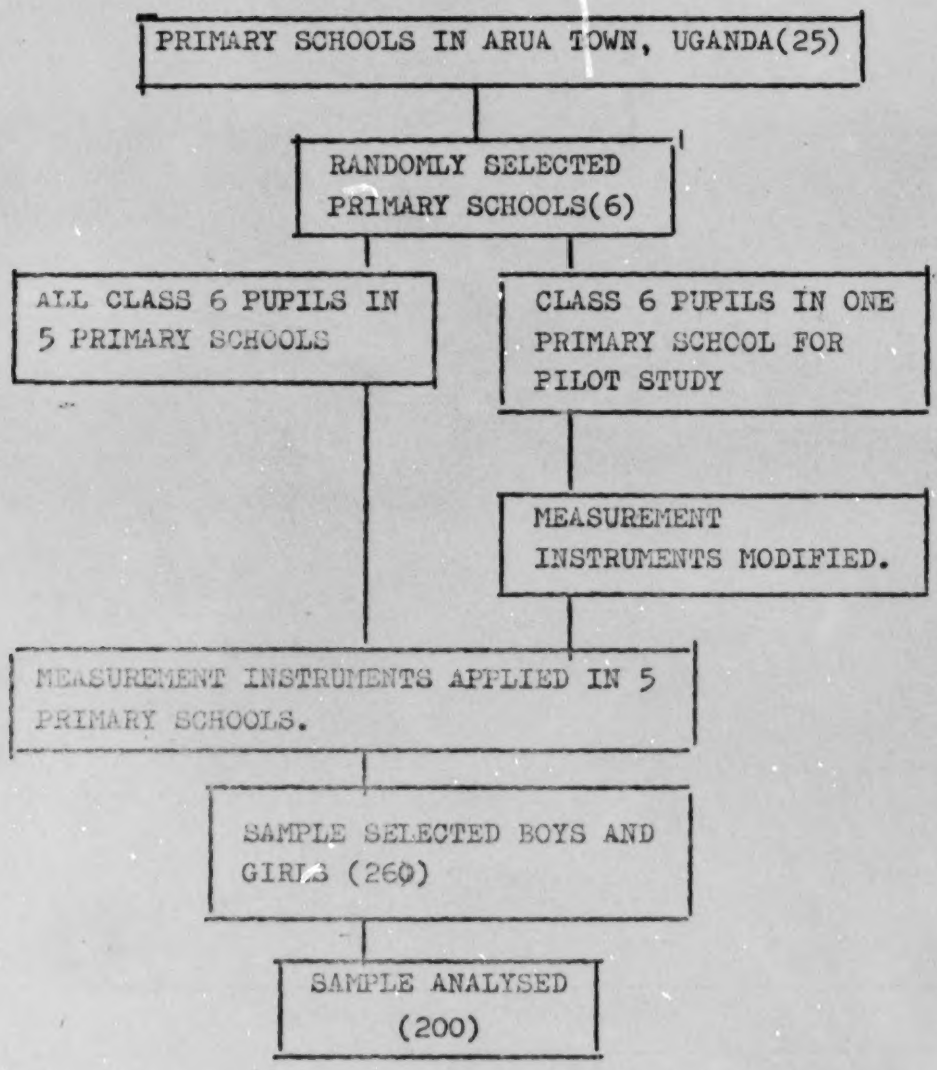

PRIMARY SCHOOLS IN ARUA TOWN, UGANDA(25)
RANDOMLY SELECTED PRIMARY SCHOOLS(6)
ALL CLASS 6 PUPILS IN 5 PRIMARY SCHOOLS
CLASS 6 PUPILS IN ONE PRIMARY SCHOOL FOR PILOT STUDY
MEASUREMENT INSTRUMENTS MODIFIED.
MEASUREMENT INSTRUMENTS APPLIED IN 5 PRIMARY SCHOOLS.
SAMPLE SELECTED BOYS AND GIRLS (260)
SAMPLE ANALYSED (200)

TABLE III: STAGES THROUGH WHICH THE FINAL SAMPLE WAS SELECTED.

PRIMARY SCHOOLS	TOTAL NUMBER IN CLASS	AT LEAST ONE INSTRUMENT DONE	ALL THREE INSTRUMENTS DONE	NUMBER SELECTED
1.ARUA HILL	82	72	72	70
2.AWINDIRI	58	50	50	46
3.ARUA PUBLIC	53	45	43	38
4.EDIOFE GIRLS	32	24	24	23
5.ARUA PRIMARY	35	25	25	23
TOTALS	260	216	214	200

NB: RAGEM PRIMARY SCHOOL WAS USED FOR PILOT STUDY.

Out of the 200 subjects in the final sample, 100 were girls and 100 boys. The age ranges of the subjects were from 11 years old to 18 years old; with the majority of 58% between 14 to 15 years old. This rather high median of the age level is due to the effects of war in this district which stopped educational activities for three years.

3.30: DEVELOPMENT OF MEASUREMENT INSTRUMENTS.

The instruments for data collection were basically three:

(a) Questionnaires for pupils.
(b) Science Achievement Test.
(c) Mental Ability Test.

The Questionnaires for pupils and the Science Achievement Tests were constructed by the investigator. A ready made Mental Ability Test by "OTIS. A.S." was obtained from Makerere University and used.

3.31: Questionnaires for Pupils.

The Questionnaires were basically designed to collect information about the subjects on the Social Environment of their home and on the subjects themselves.

Very short and specific questions demanding mostly "Yes/No" or "One Word" answers were written and accumulated during literature review exercise.

In total there were 35 questions used for measuring the Social Environment of the home. i.e. the child's interaction with the people, activities and conditions in the home. These questions on Social Environment of the home were divided into four sub-variables as follows:

(a) Parental Unity (PU), i.e. the harmony closeness, or oneness of the union between the child's parents - 5 questions.

(b) Parental Status (PS), i.e. the ranks, or positions held by the parents, in relation to others - 5 questions.

(c) Parental Encouragement (PE), i.e. parents' positive contribution towards the child's schooling by providing facilities and services to make the child pick up interest in schooling - 10 questions.

(d) Family Conditions (FC), i.e. Family size, languages spoken and the home facilities for easy living - 15 questions.

The questions were pre-tested for ambiquity and clearity and then modified for final investigation. The final copy of these questions are as shown in Appendix I.

3.32: Science Achievement Test.

A science achievement test was constructed by the investigator. Using the skills from references on Test Construction, Examinations and Assessment, the following steps were taken to construct a Science Achievement Test.

(a) The National Primary Science Syllabus for Uganda was studied in detail especially the parts for classes 3 to 6.

(b) The contents of the syllabus for classes 3,4,5 and 6 was summarised into different topics.

(c) A list of the topics was given to each class 6 in the schools; together with their teacher, the tppics already covered were ticked.

(d) The lists were collected together with some termly science test questions from the teachers.

(e) Topics commonly taught in all sample schools were then selected and questions framed on them.

(f) The questions were pre-tested in the trial - school. Each question was then analysed for suitability and ambiquity. The difficult questions were eliminated and others modified. The science test consisted of short "one-word" answer questions and multiple - choice type of questions. The final copy of the test is as shown in Appendix II.

3.33: Mental Ability Test.

There was a need to use mental ability test as one of the main independent variables. Many people have done work on the relationship between intelligence Quotient and Achievement in school as outlined in the literature review. Hence this

was the best variable for confirming the relationship between social Environment of the home and achievement in Science at School.

The investigator used one of the Intelligence Tests commonly used by past researchers at Makerere University especially the M.ED. students i.e. "OTIS SELF-ADMINISTERING TEST OF MENTAL ABILITY BY A.S. OTIS, PH.D.". The raw scores of the test were then converted to I.Q. for each subject.

3.40: ADMINISTRATION OF THE INSTRUMENTS AND DATA COLLECTION.

3.41: General Administrative Methods.

The three instruments for measurement were all group administered using whole classes. Each subject had a copy of each of the instruments during the exercise. The questions were read out one at a time, by the investigator, before giving time for answering. The classroom teachers were asked to help the investigator and his assistant, in the administration of the instruments. The subjects in class 6 in each school were informed at least one day in advance about the nature and purpose of the exercise. They were also asked to collect specific information for certain questions from their parents' education, subjects' dates of birth etc.

3.42: Questionnaires for Pupils.

The pupils were told of the purpose and confidentiality of the exercise and the fact that the results of the exercise would not be used by the school authorities for assessing them. The investigator and the teachers helped the subjects to fill the information about each subject in the spaces provided at the top of the questionnaires. The questions were read one at a time and the subjects were given time to put a tick infront of the answer applicable to each one of them. At the end of the exercise, the questionnaires were collected, packed and lebelled with the school name for coding exercise. The same procedure was repeated with class 6 in the next school, until all the selected schools were covered. At each school visited, the assistant of the investigator, collected from registers; the age records and number of days each subject had not come to school that term.

3.43: Science Achievement Test.

In each school, the purpose of the exercise was repeated and subjects were told spelling mistakes and use of vernacular languages in science test would not be penalised. After allowing time to fill the preliminary information, the investigator again read the questions one at a time

and gave time for writing answers. At the end of the exercise, the scripts were collected for marking. The same procedure was repeated with class 6 in the next school, until all the selected schools were covered.

3.44: Mental Ability Test.

The selected mental ability test was group administered in the same way the Questionnaires and Science test was administered. At the end of the whole exercise of administering all the three instruments and collecting the necessary information the investigator thanked the Headmaster of the schools, teachers and the class 6 pupils. The exercise took half a day in each school and so the investigator decided to use one morning in each school.

3.45: Data for other variables.

During the exercise of administering the instruments in each school, the assistant to the investigator used class 6 Registers for collecting the following records:

(a) Age Records of each subject in the class.

(b) Records of School Attendance of each subject in the class.

(a) Age Records.

The chronological age record of each subject was

collected in years of age. The age of each subject was important in converting the Mental Ability Test scores into Intelligence Quotients. The three instruments each collected age records of each subject. The subjects were informed a day earlier to confirm their dates of birth from their parents. The age records given by the subjects were then compared with that from the Registers. The age records of the subjects were also important as another Independent Variable.

(b) Records of school Attendance.

The number of days each subject did not come to school in that term was recorded. Then this information was graded into A, B, C and D using a range from those who least missed school to those who rarely attend school.

The school attendance, age records and the I.Q. were used as controls for confirming the relationship between achievement in science and the social environment of the home.

3.50: METHODS OF DATA ANALYSIS.

In this section only the methods for analysing the data collected was outlined. Before analysis, the data collected was processed and presented as a summary, on a master sheet as shown in Appendix III.

3.51: Graphic Data Presentation.

Histograms and a Graph were drawn to vividly illustrate the distribution of various data collected: eg.

(a) The distribution of the science achievement test scores for the sample, Girls and Boys on the same axes.

(b) A Graph to show the relationship between means of scores in science achievement test and age records was drawn.

(c) The distribution of the Mental ability test scores for the sample, Girls, and Boys on the same axes.

(d) The distribution of the Intelligence Quotients (I.Q.) for the sample, Girls and Boys on the same axes.

(e) The distribution of the frequences of the records of the school attendance as classified into groups of A, B, C and D for the sample, Girls and Boys on the same axes.

(f) The distribution of the fequencies of the age records according to age levels for the sample, Girls and Boys on the same axes.

3.52: The Significance of the Differences between Means.

The significance of the differences between means were calculated, for drawing up relevant inferences eg. the significance of the differences between means for girls and boys of:

(a) Mental Ability Test Scores.

(b) Intelligence Quotients.

(c) Science Achievement Test Scores.

(d) Age Records.

(e) Science Achievement Test Scores for groups A, B, C and D in the school attendance records eg.:

(i) Between means of science achievement test scores for girls and boys in attendance groups A, B, C and D.

(ii) Between means of science achievement test scores for the samples in groups A and B, B and C, and C and D.

3.53: The Calculations of Correlation Coefficients (r) and their Significance.

Several correlation coefficient calculations

were carried out, including determination of their levels of significance. The following are a list of the calculations which were carried out using the Spearman's Rank Order correlation Coefficient Formular:

(a) Calculations of correlation Coefficients- Science achievement test scores and each of the independent variables and sub-variables eg. Social environment of the home; sub-variables of Parental Unity, Parental Status, Parental Encouragement and Family Conditions; I.Q. and School Attendance.

Each of the results of correlation coefficients obtained were tested for levels of significance by comparing the calculated:

(i) t - test figures with the tabulated t - test figures, or,

(ii) correlation coefficient (r) with the tabulated correlation coefficient table for significance.

(b) Controlled correlation coefficients were calculated between science achievement test scores and the social environment of the home. The following controlling factors were used for drawing the samples for the above calculations:

(i) The subjects with High I.Q. (100 and above) and High attendance records (A and B).

(ii) The subjects with low I.Q. (Below 100) and low attendance records (C and D).

(iii) The subjects with High I.Q., High attendance and low age records (14 and below).

(iv) The subjects with low I.Q., Low attendance records and high age records (15 and above).

The means of the age records and the means of the science achievement test scores of these controlled groups were also calculated.

(c) The following additional correlation coefficients were also calculated:

(i) Social Environment of the home and I.Q. for sample, Girls and Boys.

(ii) Science Achievement Test scores and the age records for the sample, Girls and Boys.

NB: Due to time factor, the whole of (b) and (c) (i) were not carried out.

C-H A P T E R IV

A N A L Y S I S O F D A T A

4.10 DATA PROCESSING AND PRESENTATION.

All the data collected were presented on a master Sheet before analysis. The data already processed was presented as shown in Appendix 111. The processing of the data from each instrument was carried out as shown below:

4.11: Questionnaires for Pupils

The questionnaires were processed by "Coding frame" method, using figures 1 and 2. The lowest coding figure 1 and the lowest total obtained indicates a closer relationship to Science. For example it was assummed that a subject who stays with both of the parents in one place would be more comfortable and so should have achieved higher in Science. All the questionnaires for the subject, in the sample were coded and totalled.

The totals obtained were ringed beside each of the four subheadings, from which the totals for each subject were reached.

4.12: Science Achievement Test.

The raw scores of the Science achievement test, marked as a percentage, were used for analysis without any transformation.

4.13: Mental Ability Test.

The answers of the mental ability test were worked and worked out as a percentage. These raw scores of the mental ability test were then used for calculating the Itelligence Quotients of each subject. The following steps were taken for coverting the totals of raw scores from the mental ability test into Intelligence Quotients of each subject:

(a) The mean of the raw scores of the sample, from the mental ability test and the mean of the Chronological ages of the sample, were calculted, using the formula:

$M = \frac{\Sigma X}{N}$;Where:

M = Mean,

Σ = Sigma or Sum of,

X = Raw Scores or Age Records,

N = Number of Sample.

(b) The Standard Deviation (SD) of the Age records for the sample, and the Standard Deviation of the Mental Ability Test scores for the sample, were calculated, using the formula below:

$$SD = \sqrt{\frac{\Sigma X^2 - \frac{(\Sigma X)^2}{N}}{N - 1}}$$

Where:

SD = Standard Deviation,

Σ = Sigma or Sum of,

X = Raw Scores or Age Records,

N = Number of sample.

For obtaining the Itelligence Quotients of each subject in the sample, the following additional steps were then taken:

(c) The Raw Scores of the Mental Ability Test of each subject were converted to Z Scores in Standard Deviation Units, using the formula below:

$$\frac{X - \bar{X}}{SD} = Z;$$ Where:

Z = Figure obtained in Standard Deviation Units,

X = Raw Score of each subject,

$\bar{X}$ = Mean of the Raw Scores for the sample,

SD = Standard Deviation of the Raw Scores for the sample.

(d) The Z Scores in standard Deviation Units for each subject were then used for calculating the Mental Age (MA) of each subject, using the formula below:

$$\bar{X} \pm Z(SD) = MA;$$ Where:

$\bar{X}$ = Mean of Chronological Age (CA) for the sample,

Z = Number of Standard Deviation Units obtained above,

MA = Mental Age

SD = Standard Deviation of the Chronological Age (CA) for the sample.

(e) The results of the Mental Age (MA) Calculated above were then used to calculate the Intelligence Quotient (I.Q) of each subject in the sample,

using the usual formula below:

I.Q = $\frac{MA}{CA} \times 100$; Where:

IQ = Intelligence Quotient,

MA = Mental Age,

CA = Chronological Age.

The results of the Intelligence Quotients obtained for each subject were then used for ranking the subjects for analysis. The results of Science achievement test were similarly ranked, from the highest to lowest, for analysis. The codings of questionnaires were also ranked from the lowest to highest for analysis.

4.14: School Attendance.

The information on School attendance were collected from Registers. The recorded number of days each subject did not come to School that term up to the date of starting this data collection exercise in the area, were used. The investigator determined ranges for dividing the subjects into groups A to D. The ranges determined by the investigator for giving grades A to D to each subject, were as shown below:

0 - 4 days absent = A

5 - 8 days absent = B

9 -12 days absent = C

13days and above absent = D.

These ranges were chosen for convenience as most subjects had between 0 - 4 days of absence from School. Only very few (16 out of 200) missed school for more than 13 days. These grades were then presented on master sheet and used with means of Science Achievement Test Scores for the groups, during the analysis exercise.

Part of this "Master Sheet" without the full names of the subjects (Promissed Confidentiality) and without the rankings has been included as Appendix 111.

4.20: DATA ANALYSIS AND INTERPRETATION

The strategy adopted for the analysis of the data collected has been divided into two different stages as outlined below:

4.21: Graphic Data Presentation and Tables of Means.

4.22: Correlation Coefficients (r).

4.21: Graphic Data Presentation and Tables of Means.

Histograms and a graph presented in this section, have been drawn to vividly illustrate

the distributions of various data collected, as shown in the following discussions:

(a) Science Achievement Test.

A Histogram of distribution of the Science achievement test scores was drawn for the sample, girls and boys, on the same axes as shown in Figure 3.

(b) Age Records.

A Histogram of distribution of the age records was drawn for the sample, girls and boys, on the same axes as shown in Figure 4. However, considering the age for beginning Primary Class one in Uganda, which is six years of age, most of the subjects in this class six seem to be too old for the class level. This is mainly because of the recent wars in the area which stopped educational activities in the area for about three years. Hence the presence of age levels at 11, 12 and 13 years old might have been the subjects who continued their education in other parts of the Country and returned after the wars.

(c) The Relationship between scores in Science Achievement Test and Age Records.

A graph was drawn to illustrate vividly,

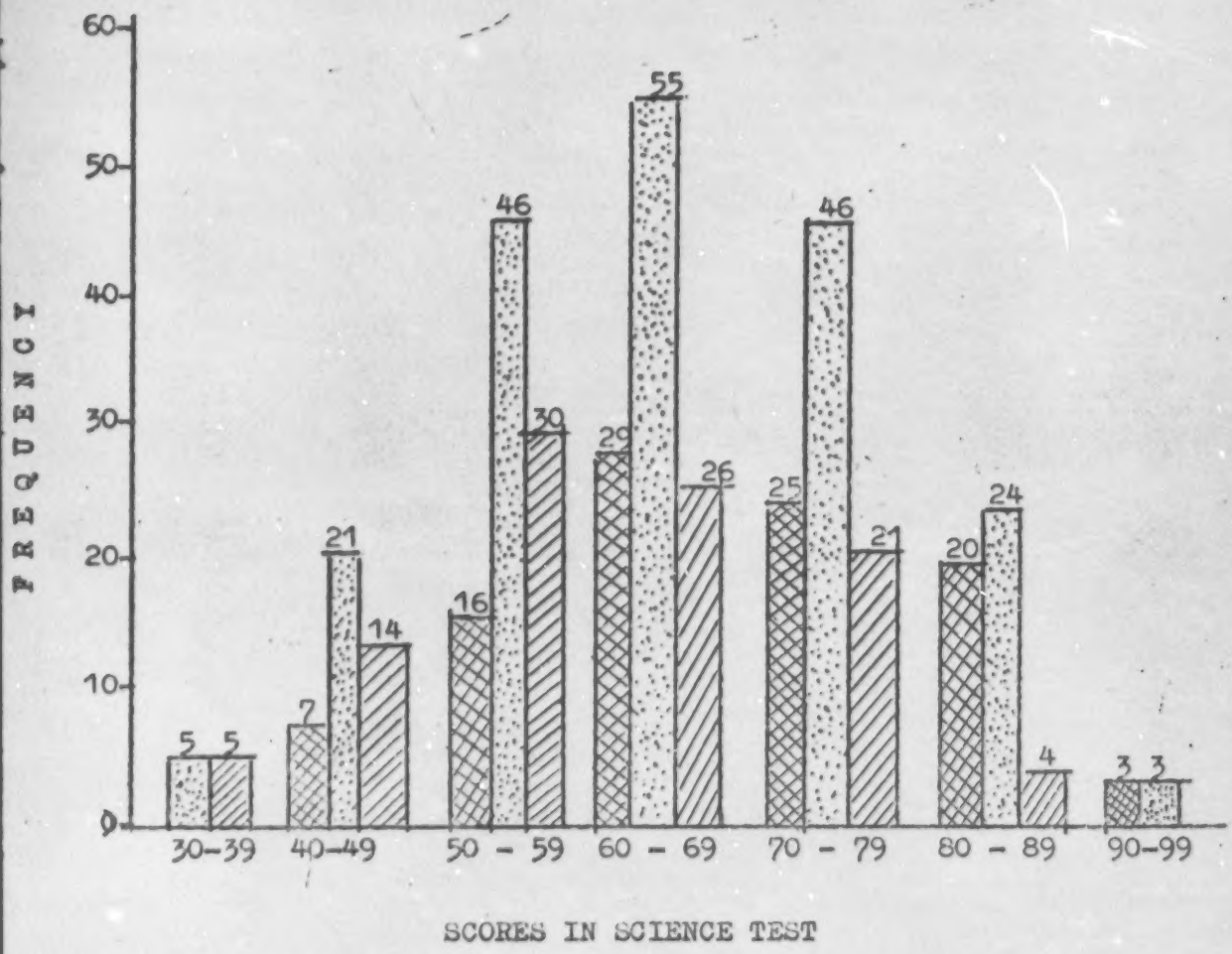


Fig.3. A Histogram of the Distribution of the Scores of Science Achievement Test.

KEY:

Boys (N = 100)

Sample (N = 200)

Girls (N = 100)

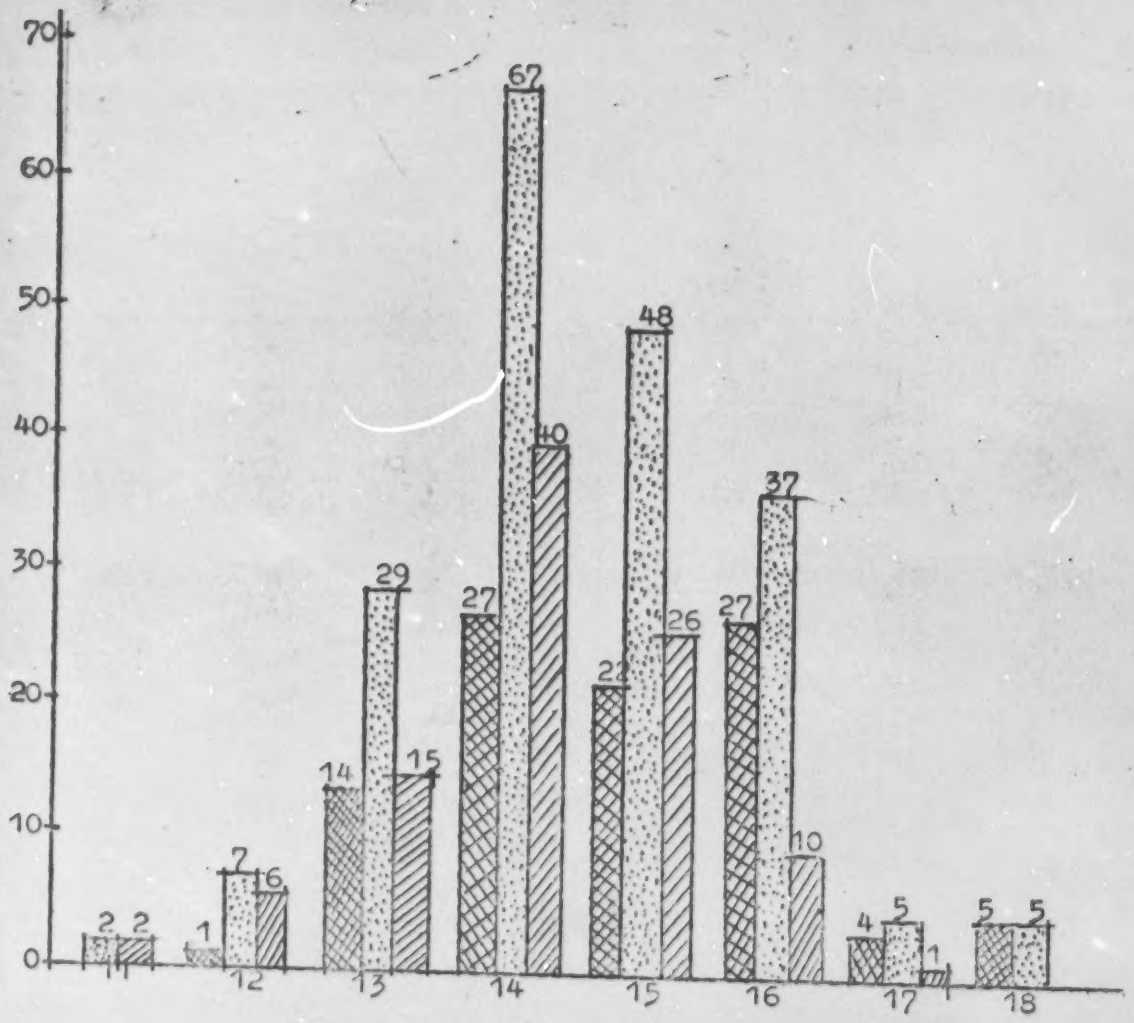


Fig.4: A Histogram of the Distribution of Age Records.

KEY:

Boys (N = 100)

Sample (N = 200)

Girls (N = 100)

the relationship between means of scores in Science achievement test and age records, for the sample, girls and boys, on the same axes as shown in figure 5, using the date in table IV below.

TABLE: IV MEANS OF SCORES IN SCIENCE ACHIEVEMENT TEST FOR EACH AGE GROUP

AGE		11	12	13	14	15	16	17	18
MEANS:	BOYS	0	66	68.71	68.59	70.91	69.37	71.75	52.8
MEANS:	GIRLS	55	83.83	62.33	60.85	54.04	62.1	46	0 -
MEANS:	SAMPLE	55	81.29	65.41	63.97	61.77	67.41	66.60	52.8

N.B: There were no girls in the sample at 18 years old and there were also no Boys in the sample at 11 years old.

As shown in the graph, boys performed better than girls in the Science achievement test and the younger subjects achieved higher than the older subjects.

(d) Mental Ability Test.

A Histogram to illustrate distribution of the scores of mental ability test was drawn for the sample, girls and boys, on the same axes as shown in figure 6.

After coverting the results of the mental ability test into Inteligence Quotients for each candidate, a similar Histogram

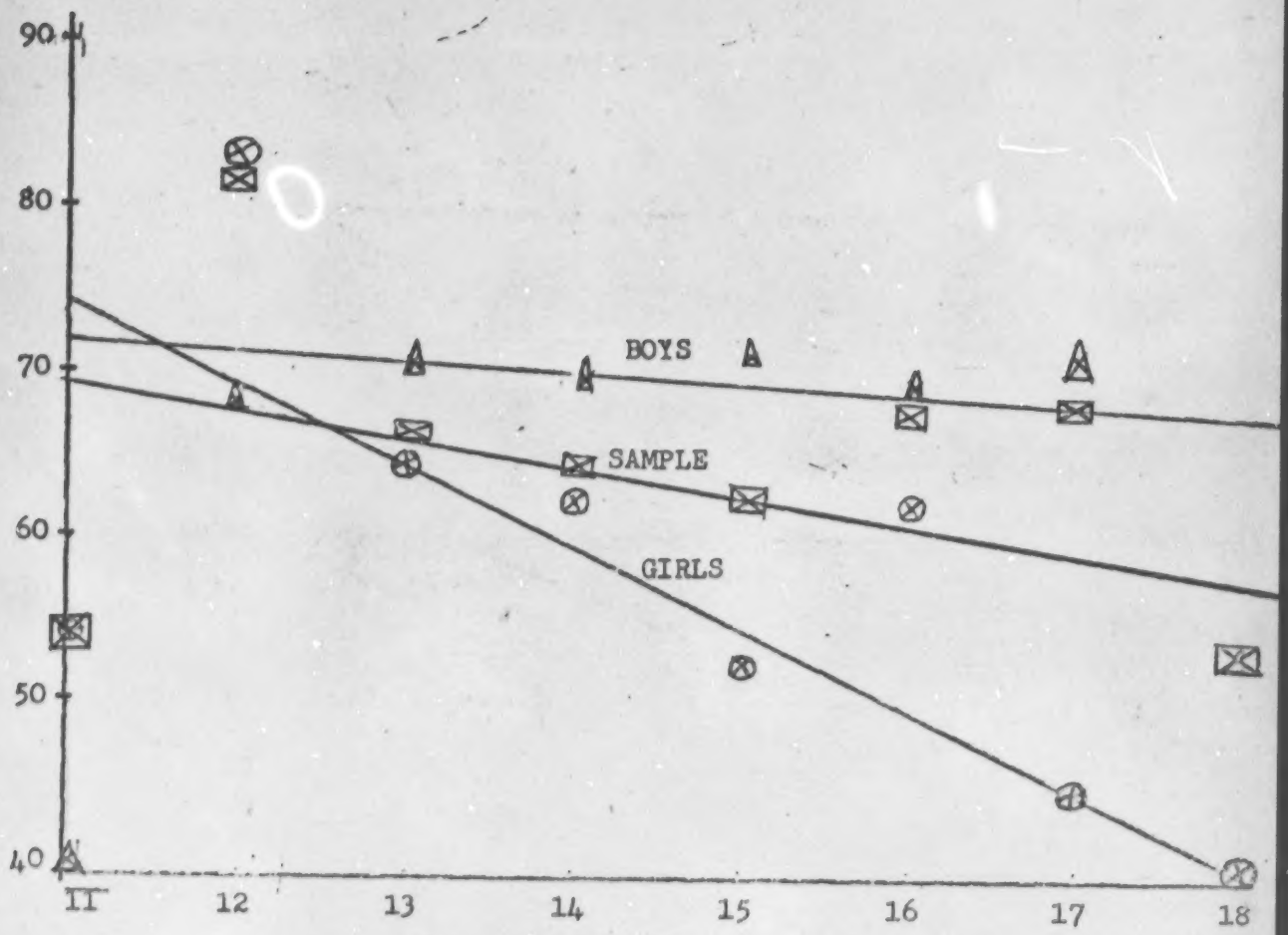


Fig.5: A graph showing the Relationship between means of scores in Science Achievement Test and Age Records.

Means for Boys. Means for the Sample.

Means for Girls.

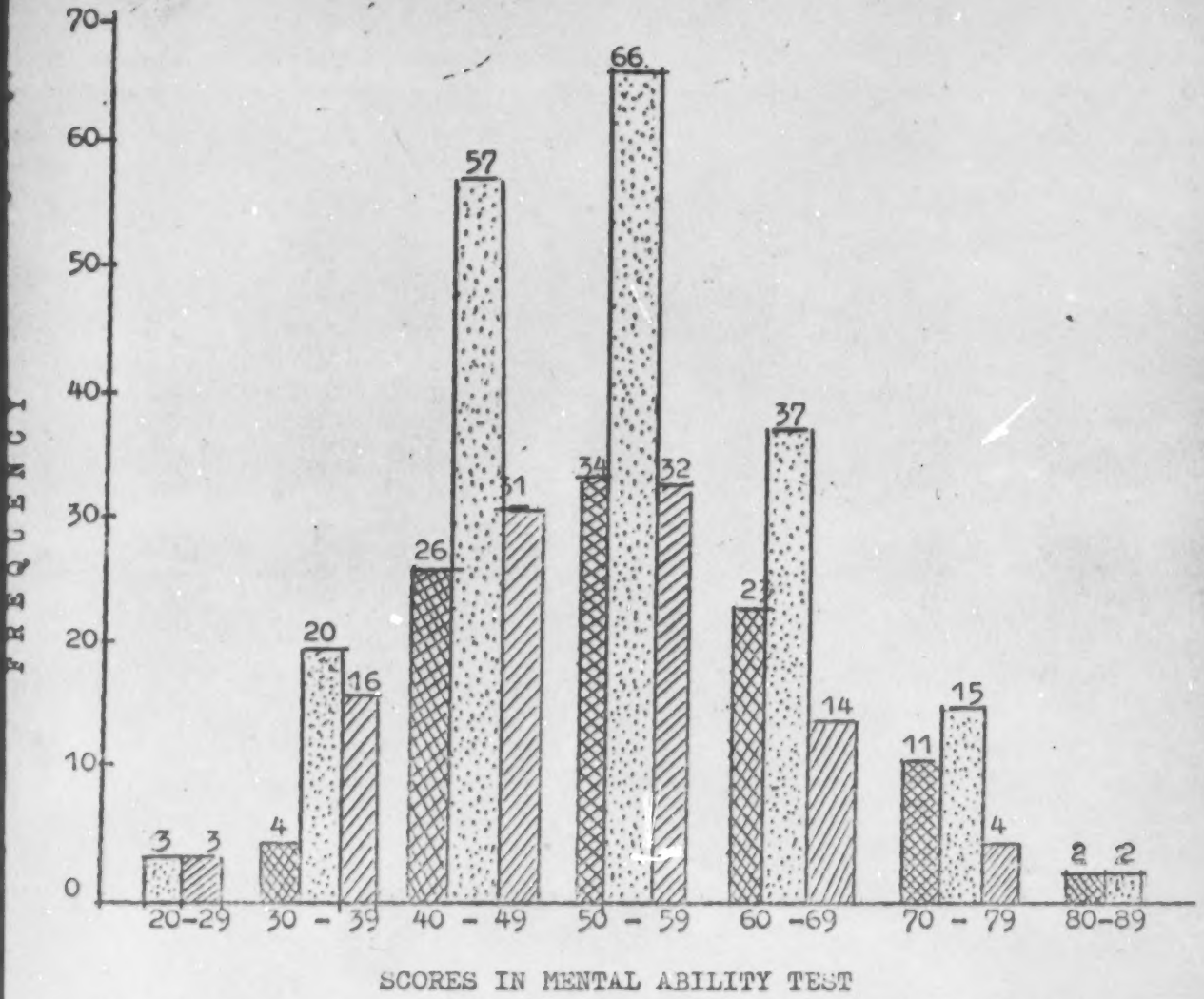


Fig.6: A Histogram of the Distribution of scores in Mental Ability Test.

KEY:

Boys (N = 100)

Sample (N = 200)

Girls (N = 100)

was also drawn to illustrate the distribution, as shown in figure 7.

The distribution of the sample is compared to the general ability classification of Mehrens and Lehmanns' table for all human population, as shown in Table V below. No body is expected to be below the I.Q. of 60 at this class six level and this was indicated in the present study.

TABLE V: Percentages (%) of the general Ability Classification of the Test Administered (SD = 15.3)

CLASSIFICATION	Itelligence Quotient	Number of Sample (out of 200)	Percentages Obtained	Percentage Expected (from Mehren
Brilliant or Genius	140 and over	2	1	1
Very Superior	130 - 139	4	2	2.5
Superior	120 -129	12	6	8
Above Avergge	110 - 119	24	12	16
Average/Normal	90 - 109	102	51	45
Below Average	80 - 89	34	17	16
Dull or Boarderline	70 - 79	17	8.5	8
Feeble Minded/Moron	60 - 69	5	2.5	2.5
Imbecile/Idiot	59 and Below	0	0	1

As shown in the differences between means on table V1 below, boys are more intelligent and achieved better in science than girls. However, girls were younger and achieved better in Mental Ability test than boys.

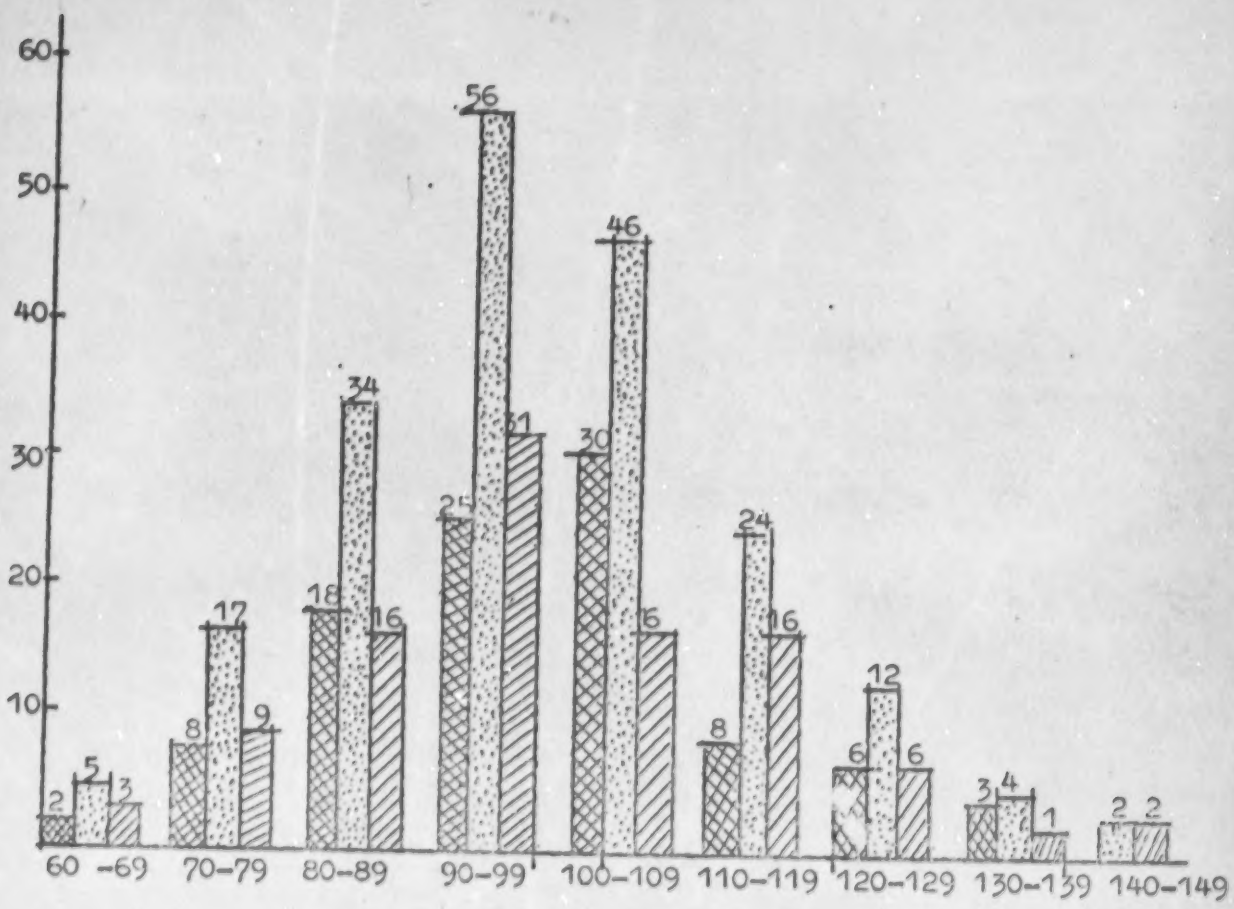


Fig.7. A Histogram of the Distribution of the Intelligence Quotients.

KEY:

Boys (N = 100)

Sample (N = 200)

Girls (N = 100)

TABLE V1:DIFFERENCES BETWEEN TWO MEANS

VARIABLES	GIRLS (100)		BOYS (100)		ACTUAL DIFFERENCE BETWEEN MEANS
	MEAN	S.D	MEAN	S.D	
(i) MENTAL ABILITY TEST SCORES	59.00	11.27	52.30	11.14	6.7
(ii) ITELLIGENCE QUOTIENTS (I.Q)	90.30	15.73	110.40	14.80	20.10
(iii) AGE RECORDS	14.16	1.20	14.92	1.21	0.76
(iv) SCIENCE ACHIEVEMENT TEST SCORES	48.40	14.86	59.60	12.52	11.20

(e) Records of School Attendance.

A Histogram to illustrate the distribution of the records of school attendance as classified from A to D was drawn for the sample, girls and Boys, on the same axes as shown in figure 8.

It can be seen that generally, the number of subjects in each group decreased from group A to group D. Hence the number of the subjects who came to school more regularly were more than those who did not come to School regularly.

Similarly, the means of the Science achievement test scores for the sample, girls and boys in each group from A to D were calculated as shown in table V11 below. As proved by Stephen Wisemann (1964), the following interpretations can be drawn from the table:

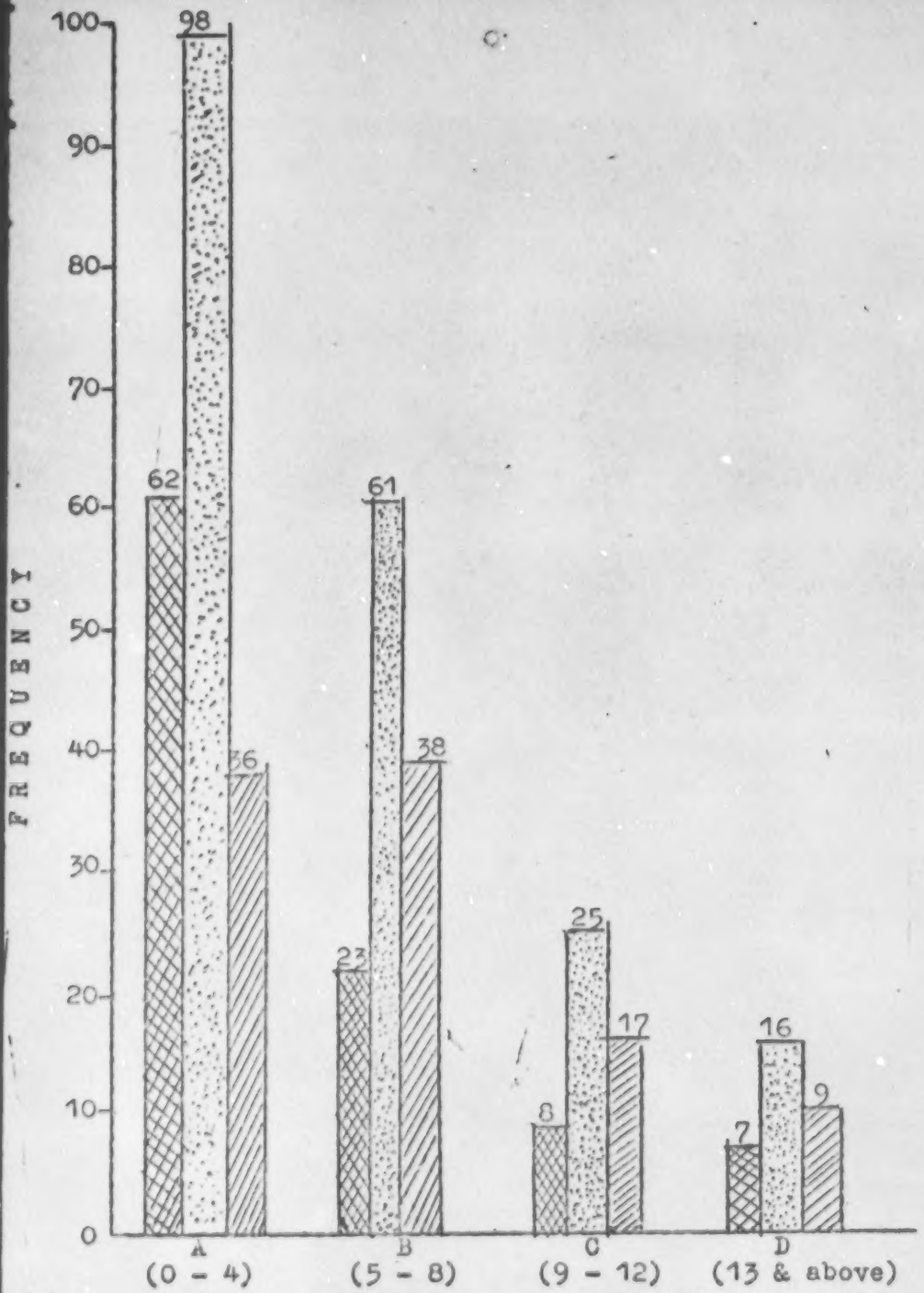


Fig.8. A Histogram of the Distribution of the records of School Attandance.

KEY: Boys(N=100) Sample(N=200) Girls(N=100)

(i) There were more subjects in A and B, than C and D. Thus, generally the total number of subjects decreased from groups A to D.

(ii) There were, generally, more Boys in groups A and B, than Girls, and there were more Girls in groups C and D than Boys.

(iii) Apart from group C, means of the Science Achievement test scores decreased along the groups from A to D. Hence brighter children tend to attend School more regularly than dull ones (Abeti 1980 and Wisemann 1964).

(iv) The calculated means for Boys and Girls indicates that in each group, A to D, Boys performed better in Science test than Girls. For the sample, the subjects in group A performed better in Science than group B. However, the differnce between means of science test scores for gorups C and D is not significant, although both were lower than group A and B. Hence brighter subjects who attend school regularly perform better than dull ones who do not attend school regularly.

TABLE: V11: Calculations of Means (M) of Science Achievement Test Scores for groups of School Attendance Records

GROUPS	SAMPLE		GIRLS		BOYS	
	NUMBER	MEAN	NUMBER	MEAN	NUMBER	MEAN
A	98	70.90	36	65.06	62	74.29
B	61	63.43	38	61.68	23	66.30
C	25	50.00	17	49.18	8	51.75
D	16	50.81	9	46.18	7	55.86

4.22: Correlation Coefficients (r).

(a) Introduction.

The correlation Coefficients (r) calculated between the variables and sub-variables, were carried out using Spearman's Rank Order Correlation Coefficient formula:

$$r = \left| - \frac{6 \Sigma d^2}{N(N^2 - 1)} \right|, \text{ where:}$$

r = Correlation Coefficient.

Σ = Sigma or sum of

d^2 = Difference between two Ranks squared.

N = Number of Sample.

Each of the results of the correlation Coefficient obtained was tested for levels of significance by using the t - test or by tabulated table of correlation Coefficient:

$$t = r \sqrt{\frac{N-2}{1-r^2}}$$, Where:

t = Figure obtained for t - test.

r = Correlation Coefficient calculated above

N = Number of Sample.

The result of the correlation Coeefficient calculated was proved significant when:

(i) The calculated correlation coefficient was MORE than the tabulated correlation coefficient at a certain percentage level for that sample; or;

(ii) The calculated t-test figure was MORE than the tabulated t-test figure, at a certain percentage level for that sample.

(b) Notes on interpretations of Correlation Coefficients (r).

(i) Correlation Coefficients only show the relationships (Correlations) between variables. Hence there are no causal connections.

(ii) Results of Correlation Coefficients may be positive (+ve) or negative (-ve), indicating the range of the relationships between the variables. Postive one (+1) indicates the extremely close or perfectly positive relationships; Zero indicates no relationship; and Negative one(-1) indicates perfectly negative relation ship.

(iii) The Null Hypothesis (HO:), is often that, "there is no relationship between the variables", and the Alternative Hypothesis (Hi:), is often that, " there is relationship between the variables".

(iv) The Null Hypothesis is Not Rejected, when the correlation Coefficient is Not significant, and thus ; the Null Hypothesis is Rejected, when the correlation coefficient is significant.

(v) When the Null Hypothesis is Rejected, then the Alternative Hypothesis is Accepted; i.e. "there is relationship; but when the Null Hypothesis is not rejected, then the Alternative Hypothesis is not accepted.

(vi) When the Null Hypothesis is not rejected, it does not mean that it is accepted. i.e. that "there is no relationship". Hence usually the Null Hypothesis is never accepted on grounds that there may not be enough evidence for rejecting it, at that moment; so that the Alternative Hypothesis is accepted.

(vii) Several operational Hypotheses may therefore be derived from the above arguments, on a result or set of results of correlation Coefficients between specific variables.

After an intensive calculations of correlation

Coefficients (r) between pairs of variables and sub-variables, the results obtained were as shown in the table VIII for interpretations.

(c) Interpretations of Correlation Coefficients (r) calculated.

From the table VIII, it can be noted that there were relationships between Science Achievement Test scores and the following varibles:

(i) Intelligence Quotients for the Sample Girls and Boys.

(ii) School Attendance Records for the Sample, Girls and Boys.

(iii) Age Records for Girls only.

The relationships between Science Achivement Test scores and the social Environments of the Home,

Table VIII: Correlation Coefficients (r) between the Dependent Variable (Scores of Science Achievement Test); and each of the Independent variables and sub-variables.

INDEPENDENT VARIABLES	CORRELATION COEFFICIENTS		
	SAMPLE (200)	GIRLS (100)	BOYS (100)
1. Intelligence Quotient (I.Q)	+0.50 Sig:01 %	+ 0.55 Sig:01 %	+ 0.46 Sig:01%
2. School Attendance (SA)	+ 0.57 Sig.01%	+ 0.50 Sig.01%	+ 0.62 Sig.1%
3. Age Records (AR)	+ 0.02 Not Sig.	+.0.22 Sig.05%	+ 0.12 Not Sig.
4. Social Environment of the Home (SEH)	+ 0.00 Not Sig.	+ 0.02 Not.Sig.	+ 0.07 Not Sig.
(a) Parental Unity (PU)	- 0.10 Not Sig.	+ 0.02 Not Sig.	- 0.24 Sig. 0.05%
(b) Parental Status (PS)	+ 0.03 Not Sig.	+ 0.05 Not. Sig.	+ 0.22 Sig. 0.05%
(c) Parental Encouragement (PE)	- 0.05 Not Sig.	- 0.06 Not Sig.	+ 0.07 Not Sig.
(d) Family Conditions (FC)	+ 0.13 Sig. 0.05%	+ 0.07 Not Sig.	+ 0.26 Sig. 0.01%

were found to be not significant.

From the same table V111, it can also be noted that there were relationships between Science achievement test scores and the following sub-variables:

(i) Negative Correlation with Parental Unity for Boys only.

(ii) Positive Correlation with Parental Status for Boys Only.

(iii) Positive Correlation with Family Conditions for the sample and Boys only.

The rest of the correlations calculated were found to be not significant. Hence there were not enough evidence for rejecting the Null Hypotheses for each of the variables and sub-variables which did not have significant correlations.

The calculations of controlled correlation coefficients (r') between the science achievement test scores and social Environment of the Home were not carried out due to shortage of time. The following controlling factors were supposed to have been used:

(i) The subjects with High I.Q. (100 and above) and High attendance records (A and B).

(ii) The subjects with Low I.Q. (Below 100) and low attendance records (C and D).

(iii) The subjects with High I.Q., High attendance and low age records (14 and below).

(iv) The subjects with low I.Q., low attendance records and High age records (15 and above)

The means of the age records and the means of the science achievement test scores of these controlled groups were also not calculated due to shortage of time.

4.30: SUMMARY OF FINDINGS

4.31: Graphic Data Presentation and Tables of means.

(a) From the graph showing the relationship between scores in science achievement test and age records, it was found out that:

(i) Boys performed better in Science than Girls. Therefore Boys are better in Science than Girls, at this class level.

(ii) Younger subjects achieved higher than the older subjects. Hence the younger subjects are better in science than the older ones, at this class level.

(b) (i) From the Histograms of the totals of the subject numbers in each group of the records of school attendance for the sample, Boys and Girls, it was noted that the totals decreased from group A to D. Hence the numbers of children who came to school more regularly were more than those who did not come to school regularly.

(ii) Therefore there were more subjects in A and B, than C and D.

(iii) There were generally more Boys in groups A and B, than Girsl; and there were more Girls in groups C and D than Boys

(Wisemann, 1964) Hence at this class level, Boys attend school more regularly than Girls.

(iv) From the Histograms of Science Achievement Test Scores, Mental Ability Test Scores; Intelligence Quotients; and Age Records it was also noted that they all followed a pattern of Normal distribution curve.

(c) From the means of the Science Achievement Test Scores; Age Records; and Intelligence Quotients, the following interpretations could be made:

(i) The mean of Age records for Boys was higher than that for Girls. Similarly the mean of Intelligence Quotient for Boys was higher than that for Girls. The mean for Science Achievement Test Scores was also higher for Boys than Girls.

(ii) Hence the results for the sample indicates that Boys performed better in Science and were more intelligent than Girls. However, at this class level, Girls were younger than Boys.

(iii) Apart from group C, means of the Science Achievement Test Scores decreased along the groups from A to D. Hence brighter children tend to attend school more regu-rly than dull ones (Abeti 1980 and Wisemann 1964)

(iv) The calculated means for Boys and Girls indicates that in each group A to D, Boys performed better in science test than girls. For the sample, the subjects in group A performed better than group B. However, the difference between means of Science test scores for groups C and D was not significant; although both were lower than groups A and B. Hence brighter subjects who attend school more regularly perform better in science than dull ones who do not attend school regularly.

4.32: Correlation Coefficients (r)

(a) The relationships between Science achievement test scores and the following variables were found to be significant:

(i) Intelligence Quotients for the sample Girls and Boys.

(ii) School Attendance Records for the sample,

Girls and Boys.

(iii) Age records for girls only.

Therefore achievement in science at this level is related to the above variables. The relationships between science achievement test scores and the social Environment of the home were found to be not significant. Therefore there was not enough evidence to establish a relationship between them. However, there were relationships between science achievement test scores and the following sub-variables of the social Environment of the home:

(i) Negative correlation with Parental Unity for Boys only.

(ii) Postive correlation with Parental Status for Boys only.

(iii) Positive correlation with Family conditions for the sample and Boys only.

(b) (i) The relationships between the science achievement test scores and the Intelligence Quotient, and Age Records were higher for Girls than Boys. Hence, indicating closer relationships for Girls than Boys.

(ii) The relationships between the Science achievement test and school Attendance records and social

Environments of the home with its sub-variables, were all higher for Boys than Girls. Hence, indicating closer relationships for Boys than Girls.

(iii) There was a significant negative correlation between Science achievement test scores and Parental Unity for Boys and a positive insignificant one for girls.

CHAPTER V

DISCUSSION AND CONCLUSION

5.10: DISCUSSION OF THE FINDINGS.

The steps taken to discuss the findings have been by taking the variables and sub-variables one by one, and discussing the findings with references from the literature review.

From the study it was found out that there was a signigicant Correlation between Intelligence Quotient and achievement in Science for the Sample, Girls and Boys. Therefore Intelligence Quotient is related to achievement in Science. However, the relationship between Science achievement and Intelligence Quotient was found to be higher for Girls than Boys i.e. + 0.55 as compared to + 0.46.

Many people have done different investigations on the relationships between Intelligence Quotient and Achievement, Kelly (1927), Wolf (Bloom, 1971) and Colemann et al.(Gage and Berliner, 1974), all recorded high correlations between Intelligence Quotients and Achievement. Nisbet (Wisemann, 1964) stated that Intelligence and Educational

Achievement are more closely related.

Douglas and Ross (Vernon, 1969), also stated that girls adjust better to Primary Schooling and are more docile than boys. Probably, this is why girls had a higher correlation than boys between Intelligence Quotient and Science, although the mean of Intelligence Quotient was higher for Boys. The girls were also younger than boys, as it was also found out that the younger children were better in Science than older ones.

However, most psychologists agree on no sharp distinction between measured Intelligence and Educational attainments; as both are products of genetic and environmental factors, and both are learned (Gage and Berliner, 1974). While this study and a previous study by the investigator (Abeti, 1980) found out that the correlations were higher for girls than boys, Douglas (1964) found out no sex difference; and Black (Wisemann, 1964), found correlations for boys higher.

This study and a previous study by the investigator (Abeti, 1980) found out that boys

were better in Science than Girls and that younger children do better in Science than older ones at this class level. There is therefore a possibility of certain factors influencing boys' achievement. This is supported by evidences from Stain and Bailey, and Horner (Gage and Berliner, 1974), which states that boys are better in mechanical and spatial skills than Girls; and that for girls achievement inscience has some built-in pwishing effects.

The mean of the age records for girls was lower than that for boys. Therefore girls were younger than boys. The correlations between Science and age records was also found to be higher for girls than boys. Hence younger children had closer relationship between Science and age records.

By analysing the school attendance records, the investigator found out that the boys were better in Science than girls in all groups, A to D. Apart from group C the performance in Scinece decreased from group A to D. The number of subjects also decreased from A to D and while there were more boys in groups A and B,

there were also more girls in groups C and D. Hence bright children attend school more regularly than dull ones and the children who go to School more regularly were more than those who do not go to School regularly, Boys attend School more regularly than girls or more girls do not attend School regularly at this class level. This might have been one of the reasons why boys were better in Science than the Girls. Stephen Wisemann (1964) and the investigator (Abeti; 1980) also found out similar results.

From the study, it was found out that the relationship between social Environment of the Home and achievement in Science was not significant. However, there is evidenc. from Skeels (Gage and Berliner,1974), which states that many variables exist in the home that affect achievement, but what exactly are these variables is not known. Douglas (1964) also found out that home environment influences achievement; and Vernon (1969) stated that poor home environment means poor achievement. However, Burt and Jensen (Vernon, 1969) stated that individual differences in rate and amount of learning depend more on genetic factors than on environmental variations.

Hence correlations between environmental variations and achievement are always low. This porobably seems to support the very low results obtained in the present investigation. Burt and Jensen, also found out that the effects of genetic factors and environmental factors on achievement are not additive but interact right from conception. The information from the Central Advisory Council for Education study - Britain (1972) states that, the home, social circumstances and academic achievement are closely related. Douglas and Ross (Vernon, 1969) also stated that social classes were most important in influencing achievement, followed by parental interest and aspirations. However, the present investigations on the sub-variables of parental Unity; parental status; parental encouragement; and Family conditions did not show conclusively significant results. There were therefore inadequate evidences for stating concrete relationships between these sub-variables and achievement in Science. However, Parental Unit, Parental Status and Family Conditions all showed significant correlations for boys. The correlation for Parental encouragement was also higher for boys. The following evidences on social environments of the home may be quoted in support of the

above findings: Skeels (Gage and Berliner, 1974) stated that good homes and parents help children to achieve better. Wolf (Bloom, 1971); Freeburg and Payne (Gage and Berliner, 1974) and Vernon (1969), all found out that lack of parental interest in education affects achievement; although the classical experimental approaches have been found to be difficult. This could be one of the main reasons why the results in the present investigations were not highly conclusive. Griffiths (Wiseмann, 1964) found out that parental encouragement was the determining factor in grammar Schools' progress in Britain; and that children of working mothers grow Intellectually better and achieve better than children of non-working mothers. Dougles and Ross (Vernon, 1969) found out that the most important factor in achievement (apart from social class) was parental interest and aspirations. They also stated that over-crowding, unsatisfactory home conditions and family size are all difficult to separate from poor maternal care and lack of parental interest. The National Child Development Study - Britain (1971) stated that children from different socio-economic groups differ in average body size at all ages; better groups differ in average body size at all ages; better groups have larger and more intelligent children and these achieve

achieve better in School. However, French (Wisemann, 1964) found out that father's occupation and achievement have no correlation; just as this present investigation shows that social Environment of the home and achievement in Science have no correlation.

Spitz, Goldfarb, Dennis and Narjarian (Verma and Williams, 1976), all found out that extreme poverty of physical and social environment in Schools and homes, cause retardation and regression in motor, perceptual and intellectual development. A report of Central Advisory Council - Britain (1972) also stated that less intelligent and less ambitions and more passive parent creates conditions which give less stimulation and support to the child's physical, intellectual and emotional development.

5.20: SUMMARY AND CONCLUSION

The present study has confirmed the results obtained by many earlier researchers on the relationships between Intelligence Quotients and Achievement in Science. The above correlations were found to be significant for the sample, Girls and Boys. It was also found out that the relationship was higher for Girls than Boys. Hence Intelligence Quotients

tend to influence girls' achievement in science more than Boys. On the other hand School attendance tends to influence Boys' achievement in science more than Girls. Thus an attempt to repeat a similar analysis of the information on the records of School attendance, by Stephen Wisemann (1964), also showed similar results.

This present study has reasonable determined that there is no significant relationship between social Environment of the home and achievement in Science. However, the sub-variables of the Social Environment of the home used in the study indicated some relationships for Boys. Similar relationships have been recorded by several researchers. The study also found out that the correlations between the sub-variables and Science were rather low. This agian has been identified by many studies earlier, which seem to emphasize that learning and academic achievements depend more on genetic factors than the environment.

This study has also given indications of possible areas for detailed research studies, in identifying the specific factors within the social Environment of the home, that influence achievement in Science. Among these possible areas, used as sub-variables

in the present study, the Family Conditions came out more distinctly than Parental Status, Parental Unity and Parental Encouragement.

Finally, the investigator wishes to express here that the actual work of data collection, Analysis and writing up the thesis was carried out and compiled in a hurry, within only one and a half months. This is mainly due to the reasons of accumulated official duties in the office while the investigator was away for residential phase in Nairobi and Secondly, the investigator was promoted on transfer and had to settle on his new responsibilities before having the little time for this project. It was also difficult to find the right size of thesis paper recommended A 4. A good secretary to type thesis was also difficult to find in up country stations like this one. As listed in the section of limiting factors and elsewhere, several usual research problems were encountered, some of which were overcomed and some were beyond the investigator's ability to solve. The investigator is however fully responsible for errors of any form that may occur in the text of the Thesis.

5.30: RECOMMENDATIONS

5.31: For Future Investigations:

(a) The investigator strongly feels that since there is hardly any information on similar researches carried out in African Schools, more of the studies to investigate relationships between Achievement in School and Home Environment should be carried out. Secondly, such studies should also involve larger Samples of about 500 - 600 subjects randomly selected from more schools of all types, and at different levels.

(b) The present insignificant results for some variables and sub-variables could be repeated.

(c) Some Longitudinal Studies on specifically selected homes could be attempted in African situations.

(d) Special studies to construct suitable standardised Science Achievement Tests, Intelligence Tests and Instruments for measuring Home Environments for African situations, should be undertaken.

(e) The Sub-variables suggested in the present study for social Environments of the home could be taken separately and studied in greater details.

5.32: For the Attention of Education Authorities in Africa:

(a) Science should be introduced as a separate paper in the selective Primary Leaving Examinations as

already done in Uganda with effect from this year. Such a Science paper should include sections on: Biology, physics, Chemistry, Agriculture and Health Science. The investigator believes strongly that if science is to play a vital role in the Nation's high level manpower section and Indigenous Technology, it has to take roots right from the Primary Schools. Teachers would then teach science with greater zeal as they presently do in English and Mathematics.

(b) More Science - biased Primary School Teachers should be trained, selected from a higher general educational standards e.g. S4 or Form four and six leavers.

(c) Parent-Teacher Associations should be encouraged for each Primary School, to co-ordinate their children's School education with their home environments.

5.33: For the Attention of ACO/GTZ Course Organisers:

(a) The Senior Officers in Ministries have limited time for such courses especially in the respect that the official duties intergere very much with such intensive courses. An relaxation of the time for the third phase would be very much appreciated.

(b) The third phase, is extremely expensive. Arrangements could be made to save some of the expenses in

the second phase for increasing the amounts for the third phase e.g. accommodating the students in the University Campus would be cheaper than the present expensive hotel accommodation, unsuitable for serious studies.

(c) National Universities should be fully involved to guide students effectively in the third phase, to the extend of meeting payments for local supervisors.

(d) A follow up conferences are necessary for reviewing experiences in the field and updating information on curriculum development.

(e) The new graduands should be automatically registered as academic members of the ACO and should receive regular circulars and documents from the Central Secretariate through the National Curriculum Development Centres.

B I B L I O G R A P H Y

BIBLIOGRAPHY

1. Abeti S.L. Factors related to learning outcomes in Science in African Primary Schools. A Masters Thesis, University of Sierra Leone (1980)
2. Arthur, Crijns. " African Intelligence: A critical Survey of Cross-cultural Intelligence Research in South of Sahara". Journal of Social Psychology. 57 (1962). pp 282-301.
3. Bloom, Benjamin. S, Thomas, J. Hastings, and Madars, F. George. Handbook on Formative and Summative Evaluation of Student Learning. McGraw-Hill Book Company (1971).
4. Burrows, G.E.R. Desian and Analysis in Educational Research, University of Birmingham (1975)
5. Davis, B. Frederick. Educational Measurements and their Interpretations. Wadsworth Publishing Company, Inc. (1964)
6. Douglas, J.W.B. The Home and the School. A study of the Ability and Attainment in the Primary School. London. Macgibbon and Lee (1964).
7. Gage, N.L. and Barliner, C. David. Educational Psychology. Rand McNally Publishing Company (1974).
8. Gilbert, G.P.S. and Lovegrove, M.N. Science Education in Africa. Heinmann (1972)

9. Mehrens, A. William and Lehmann, J. Irvin. Standardised Tests in Education. Holt, Rinehart and Winston, Inc. (1969) Chap. 111 pp. 129-200.

10. Otis S. Arthur, Otis Self-Administering Tests of Mental Ability. Intermediate Examination Form A for grades 4 - 9. Harcourt, New York. U.S.A. (1950).

11. Report: Children and their Primary Schools. Central Advisory Council for Education (England). London. Her Majsesty's Stationary Office (1972).pp. 1-26.

12. National Child Development Study. Britain. Her Majesty's Stationary Office (1971).

13. Sands, M.K. "Mixed Ability Science Teaching: Some Practices and Problems". University of Nottingham. The School Science Review. Vol. 60. No 213 (June, 1979).

14. SEPA. Handbook for Teachers. SEPA Accra, Ghana (1974)

15. Thurston, Louis L. " Primary Mental Abilities and their Psychological Implications" in W. Leslie Barnette, Jr. ed. Readings in Educational and Psychological Measurements. Homewood, IU Dorsey Press (1963).

A P P E N D I C E S

APPENDIX I

QUESTIONNAIRES FOR PUPILS

INTRODUCTION

This questionnaire is part of an investigation concerned with the relationships between social Environment of the Home (SEH), School Attendance (SA), Intelligence Quotients (I.Q) and Achievement in Science at Primary School Level. The investigator hopes to identify and dtermine some of the significant factors in the social environments of the home and relate these to the child's Achievement in Science. This will be confirmed by the Intelligence Quotients of the children and controlled by the Age and School Attendance records.

All information received for the investigation will be used for Educational Purposes only. Therefore your response to this questionnaire or any Test Administered, will be treated as CONFIDENTIAL, and no details of the respondents will be released to anyone. The Questionnaire consists of 35 questions on the social Environment of the Home, divided into four parts as shown below:

1. PARENTAL UNITY (PU) - 5 questions
2. PARENTAL STATUS (PS) - 5 questions
3. PARENTAL ENCOURAGEMENT (PE) - 10 questions

4. FAMILY CONDITIONS (FC) - 15 questions

NAME———————————— SCHOOL————————

CLASS———————————— AGE————————SEX————

PUT A TICK ( ) INFRONT OF THE CORRECT ANSWER THAT APPLIES TO YCU, IN THE SPACES PROVIDED.

A. PARENTAL UNITY

1. Are your parents both alive? Yes———— No————
2. Are you staying with both or one of your parents?
   Yes————No————
3. Do your father and mother live together? Yes———No———
4. Does your father have one wife only? Yes———No———
5. Do your parents quarrel? No————Yes————

B. PARENTAL STATUS

6. Is any of your parents working for a paid monthly salary?
   Yes————No————
7. Does any of your parents know how to read and write English? Yes————No————
8. Did any of your parents read after completing primary Education? Yes————No————
9. What work does your father do? ———————
10. What work does your mother do? ———————

C. PARENTAL ENCOURAGEMENT

11. Is your fees or any other money wanted by the school authorities paid very easily ? Yes———————

No———————

12. Are you given food before going to School ?

Yes———————

No———————

13. Are you given some money for buying things you want at School ? Yes——————— No———————

14. Do your parents give you many of the things you need for your schooling easily ? Yes——————— No———

15. Do your parents check on your school work ? Yes———

No———————

16. Do your parents help to wake you up for school ?

Yes——————— No———————

17. Do your parents buy you many of the things you want to possess ? Yes——————— No———————

18. Do your parents (or other people at home) give you some school work to do ? Yes——————— No———————

19. Do your parents give or make you some playing materials ? Yes——————— No———————

20. Do your parents talk to you about your future school or work ? Yes——————— No———————

D. FAMILY CONDITIONS

21. Are you free to play with children in nearby home?
Yes---------- No----------

22. Do your parents take you out to see places at times?
Yes---------- No----------

23. Are there five or less children staying in your family? Yes---------- NO ----------

24. Are there five or less of you sleeping in one room in your house? Yes---------- No----------

25. Are there five or less of you in school from your family? Yes---------- NO----------

26. Are both vernacular (mother tongue) and English spoken in your home ? Yes---------- No----------

27. Is your school about one mile or less from home?
Yes---------- No----------

28. Do you get water for house use from inside the house or on the compound? Yes----------No----------

29. Are you the first or second born of your mother?
Yes---------- No----------

30. Does your home have many rooms or houses for use?
Yes---------- No----------

31. Does your home have toilet facilities?
Yes---------- No----------

32. Do you have a place in your house for studying?

Yes———————— No————————

33. Do you have a place in the house or in the home for keeping your playing materials? Yes————No———

34. Do you have your own bed for sleeping? Yes———— No————————

35. Are there some Books not belonging to you, in your home? Yes———————— No————————

N.B: CODING: - Give "1" for the first answer and "2" for the second answer.

- For Questions 9 and 10:
Give "1" for Professional "Scientific" "Technical" and"Teaching" Occupation.
Give "2" for the rest of the occupations.

APPENDIX 11

SCIENCE ACHIEVEMENT TEST

NAME_____ SHOOL_____

CLASS_____ AGE_____ SEX_____

SECTION A (34 MARKS)

IN QUESTIONS 1 TO 17 WRITE THE ANSWERS BRIEFLY IN THE SPACES PROVIDED.

1. Name ONE activity you can do using a ruler.

_____(1 Marks)

2. Name THREE different uses of the Cotton plant to human life:

(i)_____

(ii)_____

(iii)_____

(3 Marks)

3. Name THREE different sources or places from where you could collect drinking water.

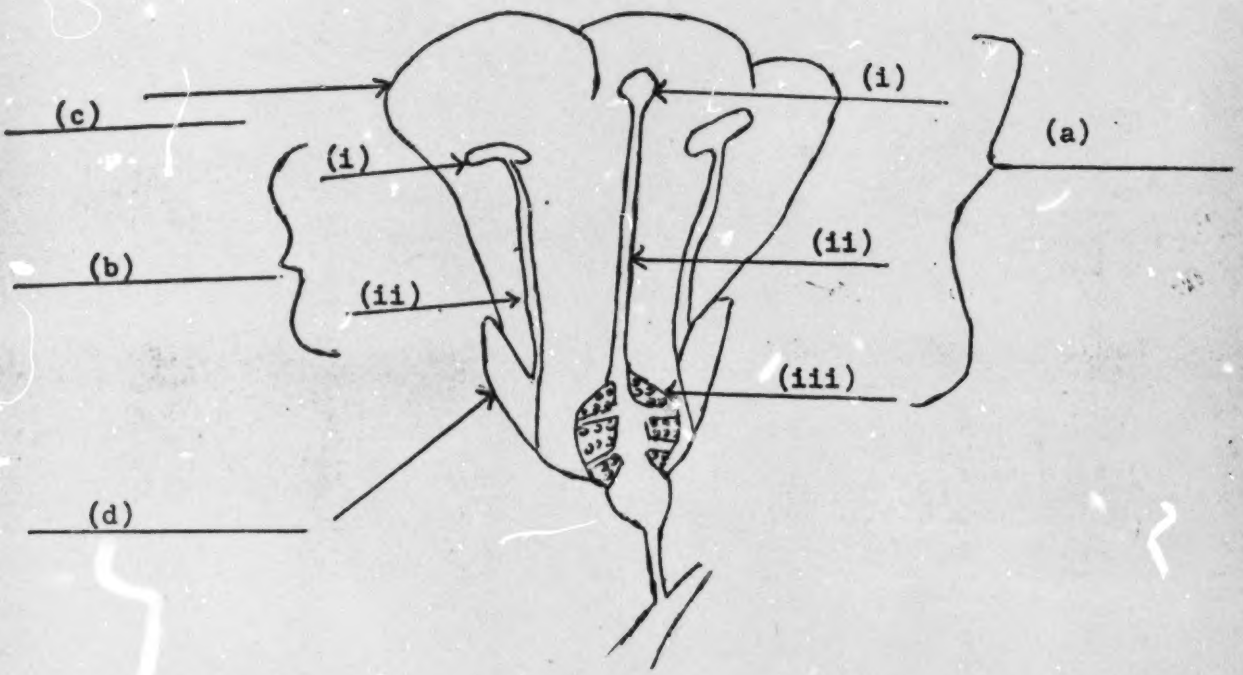
(i)_____

(ii)_____

(iii)_____

(3 Marks)

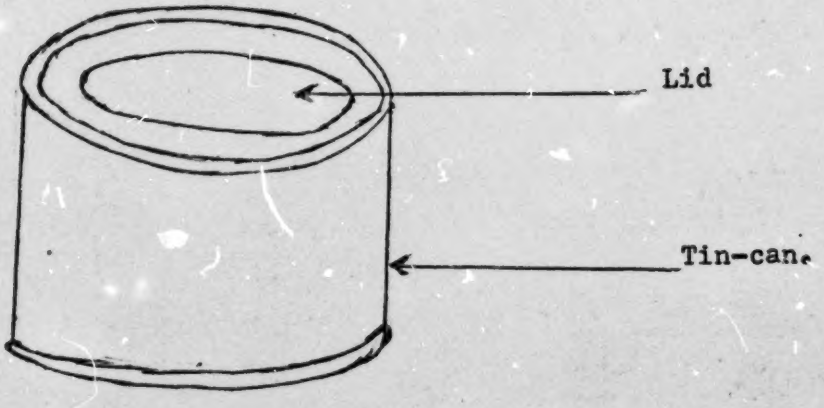
4. Diagram of a Flower.



Label (a) and (b) and ONE other (either (c) or (d).

(3 Marks).

5. A Tin - Can



Name TWO different ways you could make use of this tin-can either at Home or in School.

(i)_____

(ii)_____

(2 Marks)

6. Name ONE fruit eaten and ONE fruit not eaten

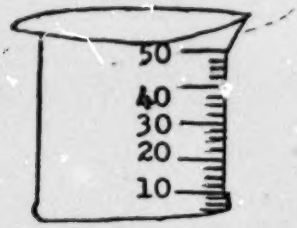
(i) Fruit eaten (edible)_____

(ii) Fruit not eaten_____

(2 Marks)

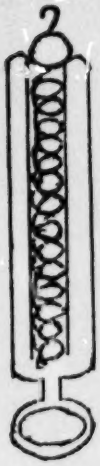
7. The following equipments (apparatus) are used for doing Science.

A-Graduated Beaker.

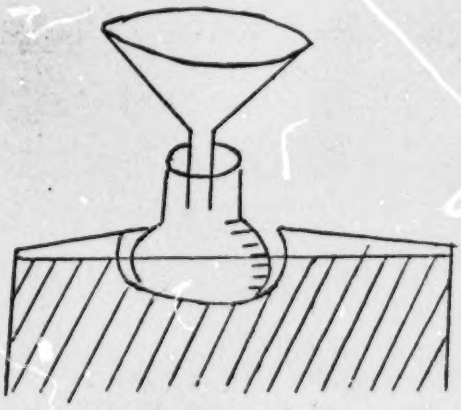


B- Thermometer.

C- SPring Balance.



D- Rain - Gauge.



Give ONE use for each of the equipments A to D above in doing Science.

A Graduated Beaker_____

B Thermometer_____

C Spring Balance_____

D Rain Gauge_____

(4 Marks).

8. Name THREE main types of Soil.

(i)_____

(ii)_____

(iii)_____

(3 Marks)

9. Name TWO animals kept in homes for human food.

(i)_____

(ii)_____

(2 Marks)

10. Name Two birds (or animals like birds) kept in homes for human food (i) _____

(ii)_____

(2 Marks)

11. Name ONE animal kept in homes for Security_____

(1 Mark)

12. Name ONE animal kept in homes for pet_____

(1 Mark)

13. Name ONE wild animal which eats grass only_____

(1 Mark)

14. Name ONE wild animal which eats flesh or meat only

_____

(1 Mark)

15. Name TWO Grain plants grown in your District for human Food

(i)_____

(ii)_____

(2 Marks)

16. Name ONE Root-tuber and ONE ste-tuber which are edible plants.

(i) Root-tuber_____

(ii) Stem-tuber_____

(2 Marks)

17. Name ONE animal that lives both in water and on land._____ (1 Mark)

SECTION B (16 MARKS)

IN QUESTIONS 18 TO 30 PUT A TICK (✓) INFRONT OF ONE OF THE BEST ANSWERS, TO YOU, A, B, C , OR D; GIVEN IN EACH QUESTION. (1 MARK EACH).

18. Water changes into different forms, such as:

A. Ice and Liquid only

B. Steam and Liquid only

C. Ice and steam only

D. Ice, steam and Liquid

19. When water changes into Ice, the space it occupies is:

A. Smaller

B. Bigger

C. The same

D. Twice as large

20. The common gases found in the atmosphere are:

A. Oxygen only C. Oxygen, and Nitrogen

B. Nitrogen only D. Oxygen, Nitrogen & Carbon-dioxide

21. Which one of the following best conducts electricity?

A. Copper wire

B. Steel wire

C. Wooden stick

D. Rubber band

22. One of the statements which makes Bats be classified as mammals is that they:

A. Have wings and can fly

B. have two legs

C. give birth to young ones

D. feed at night

23. The Whale is a:

A. Mammal

B. Fish

C. Reptile

D, Snail

24. A spider has

A. two parts of body and 8 legs

B. three parts of body and 8 legs

C. two parts of body and 6 legs

D. three parts of body and 6 legs

25. When a piece of cooked cassava or bread is left outside in a moist place for one week, the structures which grow on them are called:

A. Moulds (Fungus)

B. Bacteria

C. Starch Powder

D. Small animals

26. What is the total number of legs 5 insects would have?

A. 20

B. 25

C. 30

D. 40

27. The number of times the full moom appears in a year is:

A. 6

B. 9

C. 12

B. 24

28. When you compare the sizes of the Moon, the Earth and the Sun:

A. The Earth is the largest

B. The Sun is the largest

C. They are all equal

D. Only two of them are equal

29. Digestion of starchy food starts in the:

A. Mouth

B. Oesophagus (gullet)

C. Stomach

D. Duodenum

30. Which one of the following is not a method of keeping food for a longer time?

A. Putting fresh meat in Refrigerator

B. Drying fish and adding salt to it

C. Smoking fish and drying it

D. Adding warm water to fresh meat

31. Which one of the following are the conditions necessary for rusting of Iron nails?

A. Air and Warmth

B. Light and Moisture

C. Water and Air

D. Warmth and Water

32. Sugar-cane plant is a:

A. Tree

B. Herb

C. Shrub

D. Grass

33. The relationships between the movements of the Sun, the Moon and the Earth is that:

A. The Earth does not move, but the Sun and the Moon are moving.

B. The Sun, the Moon and the Earth are all moving.

C. The Sun does not move, but the Earth and the Moon are moving.

D. The Moon does not move, but the Earth and the Sun are moving.

NB: Mark out of 50 and multiply by 2 to get a percentage for each subject.

APPENDIX III

MASTER SHEET OF DATA COLLECTED

SEX AND NUMBER	AGE	SC. MARK	MENTAL TEST MARK	I.Q.	SEH	PU	PS	PE	FC	S.A. RECORDED	GRA.
M001	15	94	54	095	45	08	07	11	19	00	A
M002	16	92	54	089	50	09	10	11	20	01	A
M003	14	90	86	135	40	05	06	12	17	02	A
M004	16	88	66	100	50	08	07	13	22	03	A
M005	16	88	80	113	45	08	07	11	19	00	A
M006	13	86	48	103	51	05	10	15	21	00	A
M007	14	86	56	104	43	05	06	13	19	04	A
M008	14	84	74	122	46	08	08	12	18	02	A
M009	14	84	78	127	44	06	07	14	17	01	A
M010	16	84	44	080	46	07	10	12	17	00	A
M011	16	84	62	096	46	08	06	12	20	03	A
M012	14	84	60	108	48	09	10	12	17	04	A
M013	17	84	78	104	48	08	05	14	21	01	A
M014	14	84	54	102	50	07	09	13	21	03	A
M015	15	83	70	111	49	07	10	13	19	02	A
M016	14	82	50	098	41	06	06	11	18	03	A
M017	16	82	70	104	44	08	07	12	17	00	A
M018	15	82	66	107	50	08	10	12	20	02	A
M019	13	82	70	128	45	08	07	11	19	01	A
M020	14	82	56	104	44	07	06	12	19	03	A
M021	16	82	64	098	63	09	10	20	24	04	A

BEST COPY AVAILABLE

SEX AND NUMBER	AGE	SC. MARK	MENTAL TEST MARK	I.Q.	SEH	PU	PS	PE	FC	S.A. RECORDED	GRA.
M022	13	80	68	125	47	08	08	11	20	03	A
M023	14	80	56	104	55	08	10	14	23	08	B
M024	15	78	667	107	50	08	09	13	20	02	A
M025	13	78	50	106	48	09	07	14	18	04	A
M026	14	78	50	081	52	07	08	17	20	03	A
M027	15	78	54	095	48	07	06	13	22	05	B
M028	14	76	62	110	44	07	08	10	19	04	A
M029	14	76	60	108	45	05	06	15	19	03	A
M030	15	76	56	097	46	10	09	10	17	05	B
M031	15	76	72	112	45	06	09	10	20	00	A
M032	15	74	76	116	48	08	08	12	20	02	A
M033	16	74	66	100	50	07	07	15	21	03	A
M034	15	74	66	107	49	08	08	13	20	04	A
M035	13	73	66	123	51	07	09	13	22	03	A
M036	13	72	58	114	50	08	07	15	20	05	B
M037	14	72	60	108	51	08	07	14	22	04	A
M038	16	72	48	084	57	09	07	18	23	06	B
M039	15	72	54	079	50	07	08	12	23	03	A
M040	15	72	60	101	45	09	09	10	17	04	A
M041	16	72	58	093	50	06	09	14	21	04	A
M042	16	72	60	095	47	06	07	13	21	05	B
M043	16	72	52	088	53	08	10	14	21	03	A
M044	15	70	52	093	51	07	08	16	20	04	A
M045	16	70	58	093	58	06	09	19	24	03	A

BEST COPY AVAILABLE

SEX AND NUMBER	AGE	SC. MARK	MENTAL TEST MARK	I.Q.	SEH	PU	PS	PE	FC	S.A. RECORDED	GRADE
M046	17	70	46	077	49	06	08	15	20	06	B
M047	14	70	46	094	46	05	06	16	19	05	B
M048	15	70	56	097	49	08	07	14	20	04	A
M049	13	69	54	110	45	07	06	13	19	03	A
M050	16	69	74	107	51	07	09	13	22	07	B
M051	16	68	58	093	58	08	10	16	24	03	A
M052	15	68	60	101	49	07	07	13	22	02	A
M053	15	68	60	101	55	07	09	16	23	01	A
M054	13	68	52	108	50	06	10	14	20	03	A
M055	13	68	64	121	50	06	10	14	20	00	A
M056	13	68	46	101	42	06	07	10	19	04	A
M057	15	68	50	091	50	08	09	13	20	03	A
M058	17	67	46	077	53	06	10	13	24	04	A
M059	16	66	46	082	47	08	10	[illegible]	17	06	B
M060	14	66	52	100	54	06	10	16	22	05	B
M061	16	66	62	096	46	06	08	12	20	02	A
M062	17	66	54	084	50	07	09	14	20	03	A
M063	16	66	48	084	55	08	10	16	21	07	B
M064	12	66	68	136	42	08	05	10	19	00	A
M065	14	66	48	096	49	08	06	11	24	05	B
M066	16	64	70	104	49	08	10	12	17	03	A
M067	13	64	54	110	48	06	07	13	22	04	A

SEX AND NUMBER	AGE	SC. MARK	MENTAL TEST MARK	I.Q.	SEH	PU	PS	PE	FC	S.A RECO-RDED	GRA.
M068	14	62	58	106	53	05	10	15	23	02	A
M069	15	62	68	109	55	08	08	16	23	00	A
M070	14	62	50	098	57	09	10	16	22	01	A
M071	14	62	36	084	52	08	07	14	23	10	C
M072	16	62	52	088	54	07	07	16	24	08	B
M073	15	62	40	082	55	10	09	17	19	07	B
M074	16	62	46	082	50	08	08	10	24	06	B
M075	15	60	60	101	43	05	09	11	18	01	A
M076	14	60	44	092	43	05	07	14	17	14	D
M077	18	60	42	070	51	06	09	15	21	13	D
M078	15	59	40	082	46	05	09	11	21	16	D
M079	13	58	74	132	44	06	07	12	19	15	D
M080	14	58	54	102	53	07	10	13	23	04	A
M081	15	58	40	082	54	08	10	16	20	05	B
M082	16	58	50	086	47	07	07	12	21	04	A
M083	16	56	52	088	46	06	06	11	23	02	A
M084	18	56	44	071	50	07	09	15	19	03	A
M085	16	56	58	093	43	05	05	13	20	08	B
M086	15	56	34	075	53	09	08	13	23	11	C
M087	13	56	44	099	45	07	07	13	18	12	C
M088	16	54	44	080	44	08	07	12	17	13	D
M089	18	52	36	065	47	06	09	16	16	15	D
M090	14	52	48	096	42	05	06	11	20	10	C
M091	14	52	54	102	49	05	09	14	21	08	B

SEX AND NUMBER	AGE	SC. MARK	MENTAL TEST MARK	I.Q.	SEH	PU	PS	PE	FC	S.A. RECORDED	GR.
M092	16	50	42	079	65	09	10	19	24	11	C
M093	18	50	58	083	45	05	10	11	19	07	B
M094	14	48	46	094	52	07	08	14	23	09	C
M095	14	48	60	108	47	06	05	13	23	13	D
M096	18	46	34	064	47	06	05	13	23	10	C
M097	16	44	42	079	46	07	10	10	19	09	C
M098	14	44	44	092	47	06	07	11	23	08	B
M099	14	44	42	090	42	08	08	10	16	07	B
M100	13	40	40	095	44	08	07	12	19	08	B
F101	16	84	78	111	47	07	07	12	21	02	A
F102	14	84	68	116	44	08	06	11	19	05	B
F103	14	84	56	104	51	05	07	18	21	07	B
F104	12	82	74	143	54	07	08	16	23	03	A
F105	13	78	54	110	45	07	05	13	20	10	C
F106	13	78	74	132	51	05	06	15	25	01	A
F107	14	76	66	114	52	06	10	14	22	03	A
F108	16	76	56	091	54	07	09	17	21	06	B
F109	13	74	48	103	45	07	07	12	19	08	B
F110	12	74	62	129	39	05	05	10	19	04	A
F111	14	74	56	104	44	08	07	10	19	06	B
F112	14	74	64	112	55	08	07	15	25	03	A
F113	14	74	64	112	43	07	07	11	18	03	A

SEX AND NUMBER	AGE	SC. MARK	MENTAL TEST MARK	I.Q.	SEM	PU	PS	PE	FC	S.A RECORDED	GR.
F114	16	7[illegible]	64	112	55	09	10	14	22	03	A
F115	13	72	66	123	47	07	08	12	20	02	A
F116	16	72	46	082	48	05	10	12	21	08	B
F117	14	72	62	110	45	08	06	10	21	03	A
F118	15	72	32	074	52	08	10	12	22	13	D
F119	14	72	50	098	47	08	09	10	20	07	B
F120	14	70	54	102	43	09	05	11	18	05	B
F121	13	70	54	110	41	07	06	12	16	05	B
F122	12	70	42	105	44	07	07	11	19	09	C
F123	15	70	54	095	47	07	07	12	21	05	B
F124	14	70	64	112	47	07	08	14	18	02	A
F125	14	70	48	096	49	06	08	13	22	07	B
F126	14	68	50	098	40	05	06	11	18	06	B
F127	14	68	50	098	48	07	06	12	23	06	B
F128	16	68	50	086	52	05	06	18	23	06	B
F129	13	66	58	114	50	10	08	12	20	03	A
F130	15	66	48	090	46	07	06	11	22	06	B
F[illegible]1	14	66	42	090	47	07	09	10	21	09	C
F132	15	66	62	103	48	08	07	12	21	01	A
F133	13	66	54	110	48	07	07	12	22	04	A
F134	11	66	62	140	46	07	08	11	20	00	A
F135	14	66	46	094	49	07	07	15	20	03	A
F136	15	64	52	093	43	06	05	13	19	04	A
F137	15	64	60	101	53	08	08	15	22	02	A

SEX AND NUMBER	AGE	SC. MARK	MENTAL TEST MARK	I.Q	SEH	PU	PS	PE	FC	S.A. RECORDED	GR.
F138	13	64	54	110	53	09	09	14	21	05	B
F139	16	63	54	095	51	07	07	14	23	04	A
F140	12	62	58	124	49	07	07	14	21	01	A
F141	13	62	66	123	40	06	07	12	15	00	A
F142	13	62	562	112	47	09	08	13	17	03	A
F143	14	62	44	092	50	06	10	13	21	07	B
F144	15	62	44	086	48	09	06	15	18	08	B
F145	15	62	48	090	51	06	08	14	23	06	B
F146	15	62	54	099	45	08	06	12	19	05	B
F147	13	60	46	101	48	06	09	14	19	04	A
F148	14	50	54	102	43	07	08	11	17	03	A
F149	15	60	46	088	51	09	09	13	20	05	B
F150	14	60	46	094	49	07	07	12	23	03	A
F151	14	50	50	098	41	06	05	11	19	02	A
F152	13	58	58	099	41	08	06	10	17	01	A
F153	16	58	42	079	54	06	10	17	21	04	A
F154	14	58	52	100	45	07	06	13	19	03	A
F155	14	58	32	080	56	10	10	18	18	06	B
F156	14	58	46	094	57	06	09	19	23	07	B
F157	15	58	56	097	47	06	08	13	20	02	A
F158	14	58	54	102	50	06	06	14	24	01	A
F159	14	56	48	096	47	08	06	13	20	05	B
F160	15	56	32	074	51	09	07	13	22	03	A

SEX AND NUMBER	AGE	SC. MARK	MENTAL TEST MARK	I.Q ·	SEH	PU	PS	PE	FC	S.A. RECO-RDED	GR.
F161	14	56	72	120	39	05	06	10	18	15	D
F162	15	56	42	084	45	08	07	12	18	04	A
F163	12	55	42	105	45	07	09	10	19	03	A
F164	14	54	54	102	49	09	08	12	20	00	A
F165	15	54	34	076	57	07	10	16	24	05	B
F166	14	54	38	086	45	06	07	13	19	06	B
F167	14	54	58	106	47	07	06	13	21	00	A
F168	14	54	40	088	50	06	09	13	22	13	D
F169	14	54	62	110	52	09	07	15	21	08	B
F170	14	52	32	080	51	05	06	17	23	11	C
F171	15	52	56	097	49	07	10	12	20	06	B
F172	14	52	36	084	46	07	07	12	20	09	C
F173	16	52	32	069	52	09	10	12	21	07	B
F174	14	52	36	084	45	06	08	11	20	06	B
F175	15	52	28	071	50	06	09	13	22	05	B
F176	14	50	56	104	47	06	09	11	21	11	C
F177	14	50	44	092	45	07	05	13	20	08	B
F178	15	50	42	084	51	10	07	11	23	09	C
F179	14	50	32	080	48	07	07	11	23	05	B
F180	12	50	48	112	40	07	05	10	18	07	B
F181	15	50	52	093	52	07	10	13	22	05	B
F182	14	48	48	096	37	05	06	10	16	06	B
F183	15	48	48	090	45	06	08	12	19	07	B
F184	15	48	38	080	51	07	10	12	22	08	B

SEX AND NUMBER	AGE	SC. MARK	MENTAL TEST MARK	I.Q.	SEH	PU	PS	PE	FC	S.A. RECOR-DED	GR.
F185	14	48	42	090	57	10	10	16	21	09	C
F186	13	47	38	092	46	05	07	14	20	10	C
F187	17	46	44	076	41	08	06	10	17	13	D
F188	15	46	54	095	52	08	07	14	23	18	D
F189	11	44	48	122	45	06	07	11	21	11	C
F190	15	44	42	084	46	08	07	13	18	12	C
F191	14	44	44	092	57	08	10	16	23	11	C
F192	14	44	32	080	46	05	08	11	22	13	D
F193	16	42	30	068	42	06	07	11P	18	10	C
F194	13	40	40	095	50	07	06	16	21	10	C
F195	15	40	28	071	49	06	06	13	24	10	C
F196	13	38	48	103	48	06	09	11	22	20	D
F197	15	35	34	076	54	07	10	14	23	10	C
F198	15	34	26	069	50	07	09	12	22	20	D
F199	15	34	50	091	45	07	09	10	19	12	C
F200	16	32	36	073	47	08	06	11	22	15	D

K E Y:

M = MALE

F = FEMALE

SC. = SCIENCE

I.Q.= INTELLIGENCE QUOTIENT

SEH = SOCIAL ENVIRONMENT OF THE HOME

K E Y:

PU = PARENTAL UNITY

PS = PARENTAL STATUS

PE = PARENTAL ENCOURAGMENT

FC = FAMILY CONDITIONS

SA = SCHOOL ATTENDANCE